COMPUTING FOR HOME AND BUSINESS

INTERFACE AGE™

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Micros Go Shopping

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Plus:

A Look at the PET in Business

A Review of Technico SS-16

Stringy Floppy for the 6800

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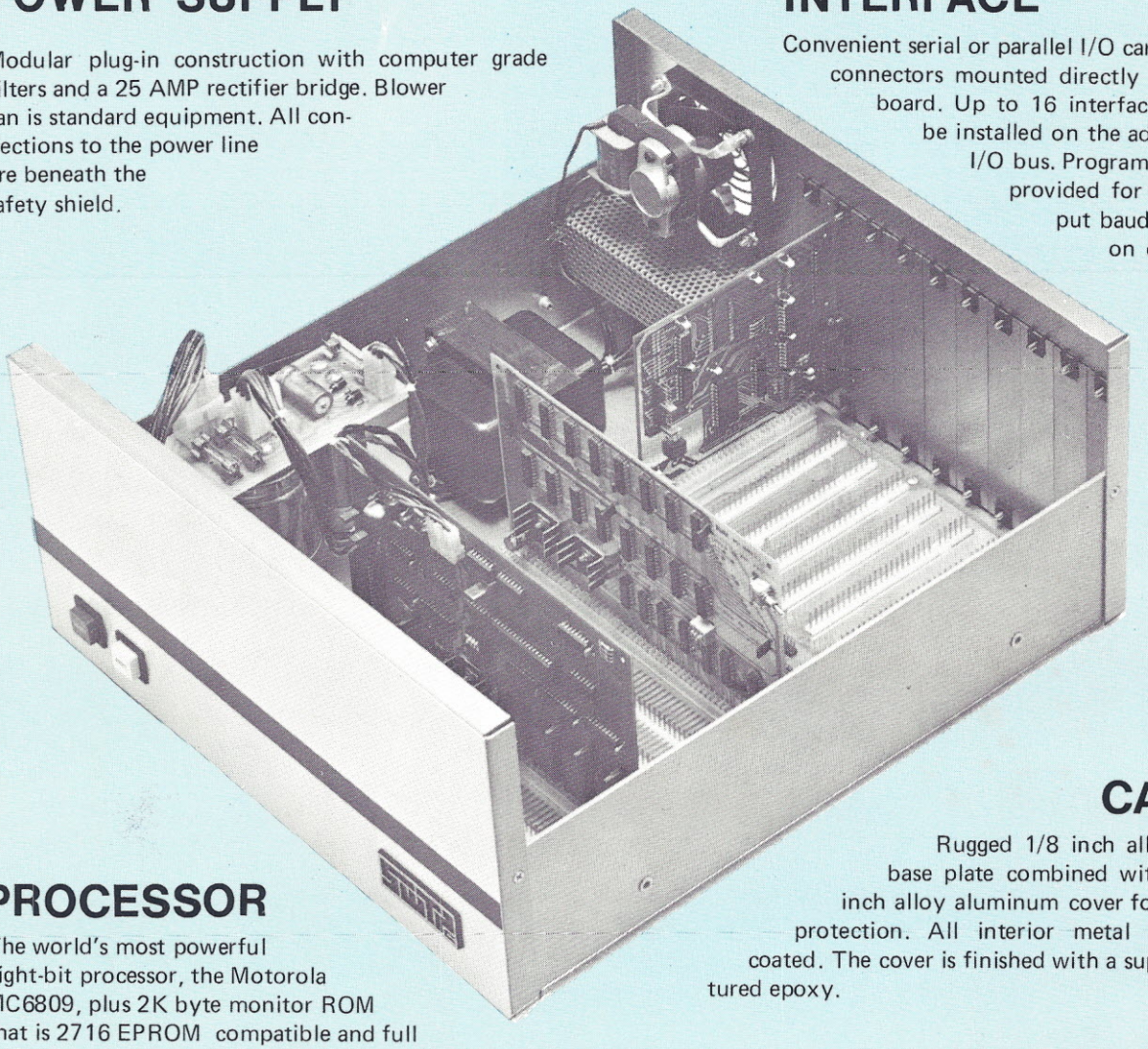
WE HAVE A 6809 FOR YOU

POWER SUPPLY

Modular plug-in construction with computer grade filters and a 25 AMP rectifier bridge. Blower fan is standard equipment. All connections to the power line are beneath the safety shield.

INTERFACE

Convenient serial or parallel I/O cards have DB-25 connectors mounted directly on the circuit board. Up to 16 interface devices may be installed on the address decoded I/O bus. Programming strips are provided for input and output baud rate selection on each port. All outputs are fully buffered.



CABINET

Rugged 1/8 inch alloy aluminum base plate combined with a solid 1/8 inch alloy aluminum cover for unsurpassed protection. All interior metal is conversion coated. The cover is finished with a super tough textured epoxy.

PROCESSOR

The world's most powerful eight-bit processor, the Motorola MC6809, plus 2K byte monitor ROM that is 2716 EPROM compatible and full buffering on all output lines. Built-in multiuser capability, just add I/O cards to operate a multi-terminal system.

MEMORY— You can purchase the computer with either 8K bytes of RAM memory (expandable to 56K), or with the full 56K. The efficient, cool running dynamic memory used in this system is designed and manufactured for us by "Motorola Memory Systems Inc."

PERIPHERALS—The wide range of peripheral hardware that is supported by the 6809 includes: dot matrix printers (both 80 and 132 column), IBM Electronic 50 typewriter, daisy wheel printers, 5-inch floppy disk system, 8-inch floppy disk systems and a 16 megabyte hard disk.

SOFTWARE— The amount of software support available for the 6809 is incredible when you consider that it was first introduced in June, 1979. In addition to the FLEX9 operating system, we have a Text Editor, Mnemonic Assembler, Debug, Sort-Merge, BASIC, Extended BASIC, MultiUser BASIC, FORTRAN, PASCAL and PILOT.

69/K Computer Kit with 8K bytes of memory . . . . . .$ 495.00
69/A Assembled Computer with 8K bytes of memory . . . . . .$ 595.00
69/56 Assembled Computer with 56K bytes of memory. $1,495.00

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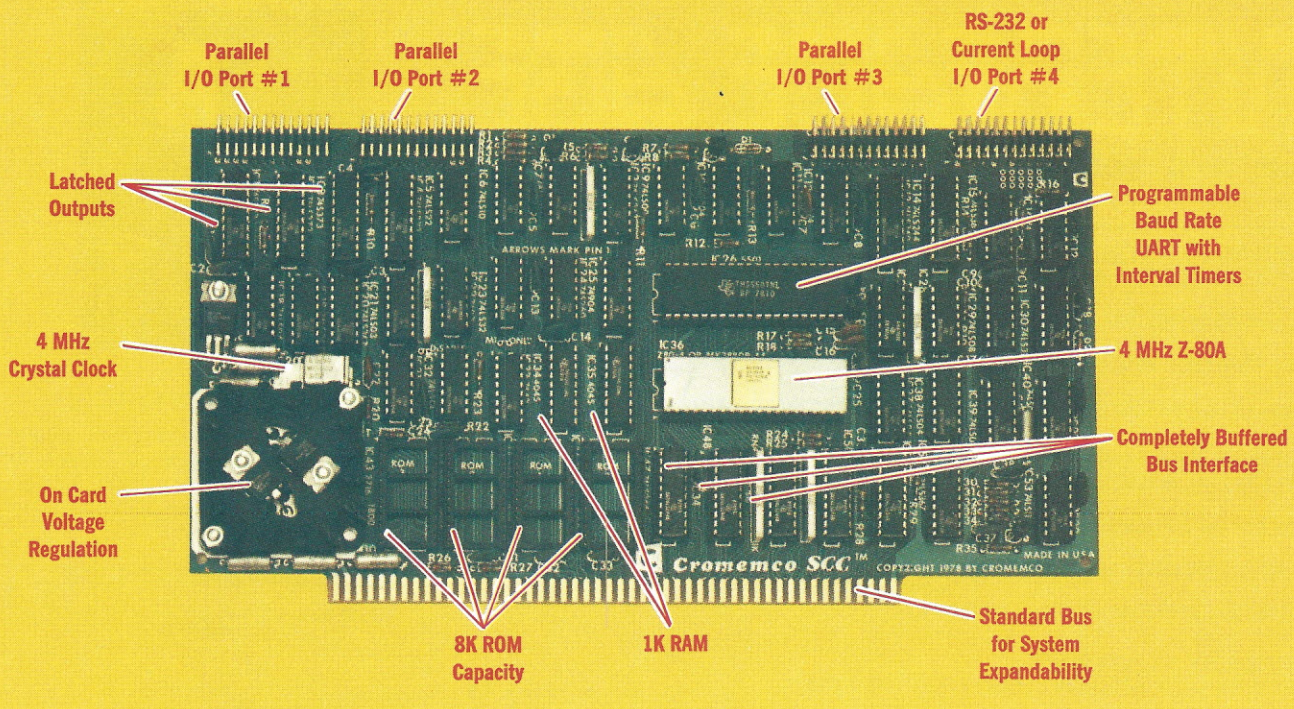
CIRCLE INQUIRY NO. 67



The single card computer with the features that help you in real life

COMPLETE COMPUTER

In this advanced card you get a professional quality computer that meets today's engineering needs. And it's one that's complete. It lets you be up and running fast. All you need is a power supply and your ROM software.

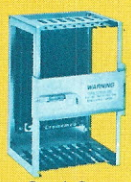
The computer itself is super. Fast 4 MHz operation. Capacity for 8K bytes of ROM (uses 2716 PROMs which **can be programmed by our new 32K** BYTESAVER® PROM card). There's also 1K of on-board static RAM. Further, you get straightforward interfacing through an RS-232 serial interface with ultra-fast speed of up to 76,800 baud — software programmable.

Other features include 24 bits of bi-directional parallel I/O and five on-board programmable timers.

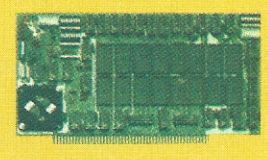
Add to that vectored interrupts.

ENORMOUS EXPANDABILITY

Besides all these features the Cromemco single card computer gives you enormous expandability if you ever need it. And it's easy to expand. First, you can expand with the new Cromemco 32K BYTESAVER PROM card mentioned above. Then there's Cromemco's broad line of S100-bus-compatible memory and I/O interface cards. Cards with features such as relay interface, analog interface, graphics interface, opto-isolator input, and A/D and D/A conversion. RAM and ROM cards, too.



Card Cage



32K BYTESAVER PROM card

EASY TO USE

Another convenience that makes the Model SCC computer easy to use is our Z-80 monitor and 3K Control BASIC (in two ROMs). With this optional software you're ready to go. The monitor gives you 12 commands. The BASIC, with 36 commands/functions, will directly access I/O ports and memory locations — and call machine language subroutines.

Finally, to simplify things to the ultimate, we even have convenient card cages. Rugged card cages. They hold cards firmly. No jiggling out of sockets.

AVAILABLE NOW/LOW PRICE

The Model SCC is available now at a low price of only $450 burned-in and tested (32K BYTESAVER only $295).

So act today. Get this high-capability computer working for you right away.

Cromemco
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Specialists in computers and peripherals
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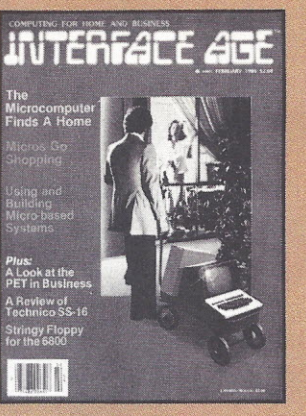
VOL. 5, ISSUE 2
SINCE DECEMBER 1975

FEBRUARY 1980

INTERFACE AGE

COMPUTING FOR HOME AND BUSINESS APPLICATIONS



THIS MONTH'S COVER

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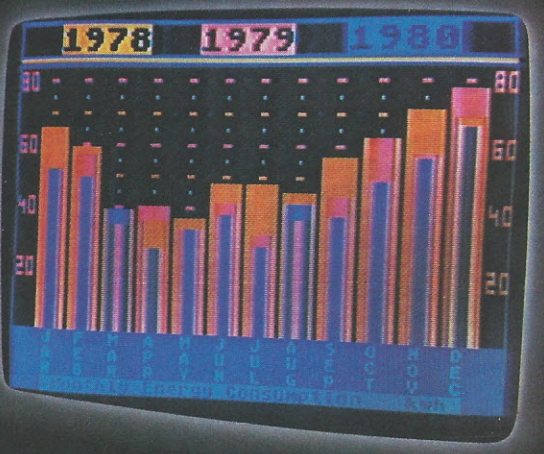

ATARI 400

ATARI 800

Compare the built-in features of leading microcomputers with the Atari personal computers. And go ahead, compare apples and oranges. Their most expensive against our least expensive: the ATARI® 400™.

Start with graphics capabilities. The ATARI 400 offers 128 color variations. 16 colors in 8 luminance levels. Plus 29 keystroke graphics symbols and 8 graphics modes. All controlled from a full 57 key ASCII keyboard. With upper and lower case. And the system is FCC approved with a built-in RF modulator. That's just for openers.

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Here's the clincher: Solid state (ROM) software. For home management, business and entertainment. Or just plug in an Atari 10K BASIC or Assembler language cartridge and the full power of the computer is in your hands.

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User-installable memory to 48K. A full-stroke keyboard.

With a high-speed serial I/O port that allows you to add a whole family of smart peripherals. Including up to four individually accessible disk drives. And a high speed dot-matrix impact printer. And, the Atari Program Recorder is included with the 800 system. Suggested retail price for the ATARI 800 (including recorder) is $999.99.

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CIRCLE INQUIRY NO. 6

Interest in business and personal computers is increasing rapidly in Europe, and American companies seem to be taking advantage of this fact while European manufacturers struggle to get their share of the market, according to many observers at the *Systems* show held recently in Munich, West Germany.

More than 30,000 people visited the four day show, which was held at a large fairgrounds. Approximately 560 exhibitors from 16 countries displayed their products. The largest number of the products were manufactured by American firms or their European branches. United States companies also have the greatest portion of the computer sales in most European countries.

IBM sells an estimated 64% of the commercial machines that are installed in Germany. Siemens, a leading German-based manufacturer, follows distantly with about 20% of the market.

Yet the European manufacturers are attempting to narrow this gap, working on interesting new peripherals and medium and small computer systems.

While a major thrust of the show was in business systems, a surprising number of visitors and exhibitors were interested in the field of hobbyist computers. Most observers could not tell whether the interest in these systems was for the operation of small businesses or for personal computing, but all agreed that the interest in microcomputers was very high.

The portion of the show devoted to personal microcomputers was larger than many had expected, and such booths were generally quite crowded. Visitors at these displays were not just interested in finding out what new products were being offered and learning how they could be used; visitors also attempted to determine any new trends and to make new contacts on both the business and end user sides of the market.

The problems of Commodore's German representative illuminates both the large interest in micros and the problems that can come from underestimating the depth of the European market.

Although Commodore shipped 10,000 PETs to Germany during a 12-month period, this was not enough to meet the demand. As a result, customers who could not get their products in what was considered a reasonable amount of time were quite upset.

At the show in Germany, the Commodore representative spent much of his time resolving any remaining problems and assuring customers that in the future the company will not advertise products in Europe until it is sure the expected demand can be met. Some of the new products Commodore presented at the show included the CBM 3000 and their new plotter, the CBM 3050.

Although Texas Instruments has long had a strong interest in the European market, they did not display their new personal computer, the 99/4. TI spokesmen explained that the company has only a limited number of machines in Europe, and that those machines are being used for software prototyping.

TI did display its 990/189, a small educational system with interesting software facilities. New additions to the 9900 family of chips, the TMS9903 serial I/O, the TMS 9911 DMA Controller and the TMS9914 IEEE-488 bus adapter, were received with interest.

A new thrust of interest by the big German computer companies such as Nixdorf, Siemens and Triumph-Adler is further testament to the increasing demand for affordable microcomputer systems for the home and small business.

Siemens, a Munich-based company that manufactures a wide variety of components and systems, has introduced the PC100, a system similar to Rockwell's single-board AIM-65.

Triumph-Adler's entry into the micro market is with its new Alphatronic machine. This 8085-based system is expandable for business use with the addition of a floppy disk drive and a printer. Software is currently available only in BASIC, although representatives say Pascal is in the works.

Nuremberg-based Triumph-Adler sees the German market for personal computers increasing at an annual rate of about 20%, so they feel it is a good time for them and other European companies to move into the market.

Thomson-CSF, a large French manufacturer, is rapidly becoming a second source of Motorola's 6800 products. They have also developed some new boards for the EXORciser, including a video board with their 96364E video controller.

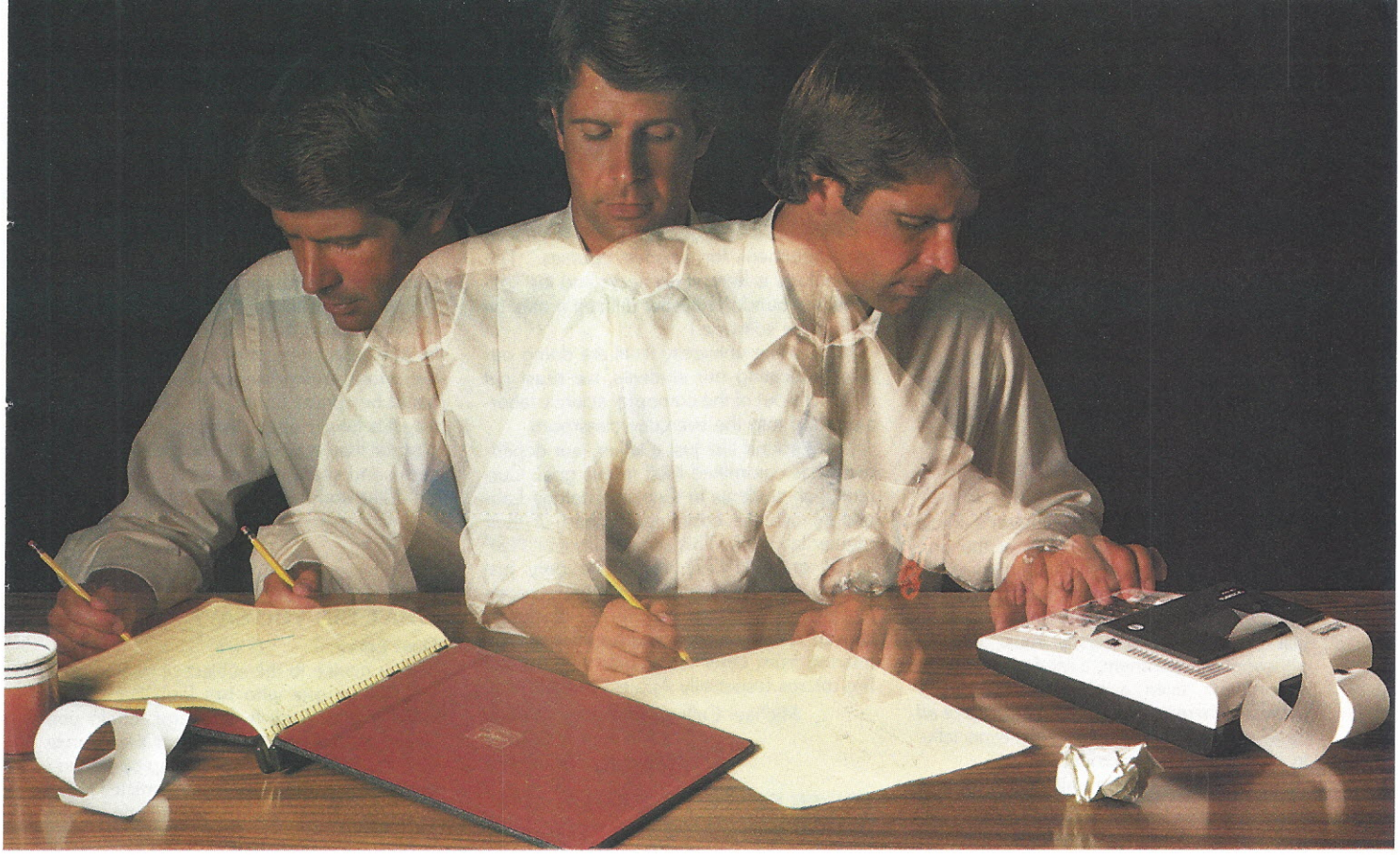
NAS displayed a Z-80-based system with 8K BASIC ROM. This single-board computer, the NASCOM-2, features a new graphics option.

One of the trends noted by many observers is the changeover from floppy disk drives to fixed disk drives. Because of this, there was much interest in Shugart's new 8-inch fixed disk drive series, which offers very low cost per megabyte. The drives are delivered in two versions, the SA1000 with five megabytes and the SA1002 with 10 megabytes.

Also on display were some new fixed disk Winchester drives. BASF offered the 6170 model, which offers a 24-megabyte capacity, but is no bigger than a floppy drive.

Although exhibitors felt the show was very successful, they have made a move that should possibly be emulated by American promoters who have had successful shows in the early years only to see attendance fall off during each consecutive show.

Rather than to attempt to schedule another show shortly after the successful 1979 presentation, the exhibitors are not scheduling the next Systems show until 1981.□



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With a calculator, pencil and paper you can spend hours planning, projecting, writing, estimating, calculating, revising, erasing and recalculating as you work toward a decision.

Or with the Personal Software™ VisiCalc program and your Apple* II you can explore many more options with a fraction of the time and effort you've spent before.

VisiCalc is a new breed of problem-solving software. Unlike prepackaged software that forces you into a computerized straight jacket, VisiCalc adapts itself to any numerical problem you have. You enter numbers, alphabetic titles and formulas on your keyboard. VisiCalc organizes and displays this information on the screen. You don't have to spend your time programming.

Your energy is better spent using the results than getting them.

Say you're a business manager and want to project your annual sales. Using the calculator, pencil and paper method, you'd lay out 12 months across a sheet and fill in lines and columns of figures on products, outlets, salespeople, etc. You'd calculate by hand the subtotals and summary figures. Then you'd start revising, erasing and recalculating. With VisiCalc, you simply fill in the same figures on an electronic "sheet of paper" and let the computer do the work.

Once your first projection is complete, you're ready to use VisiCalc's unique, powerful recalculation feature. It lets you ask "What if?," examining new options and planning for contingencies. "What if" sales drop 20 percent in March? Just type in the sales figure. VisiCalc instantly updates all other figures affected by March sales.

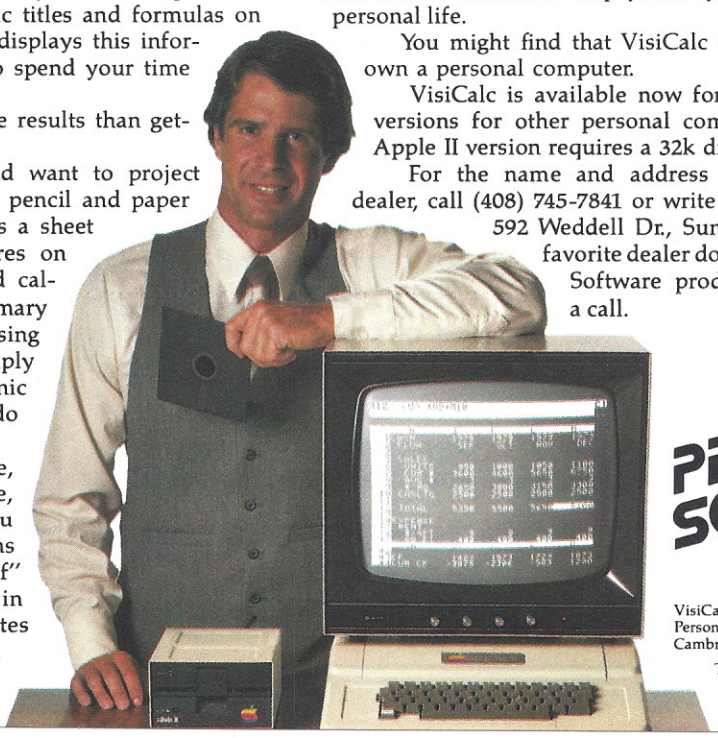
Or say you're an engineer working on a design problem and are wondering "What if that oscillation were damped by another 10 percent?" Or you're working on your family's expenses and wonder "What will happen to our entertainment budget if the heating bill goes up 15 percent this winter?" VisiCalc responds instantly to show you all the consequences of any change.

Once you see VisiCalc in action, you'll think of many more uses for its power. Ask your dealer for a demonstration and discover how VisiCalc can help you in your professional work and personal life.

You might find that VisiCalc alone is reason enough to own a personal computer.

VisiCalc is available now for Apple II computers with versions for other personal computers coming soon. The Apple II version requires a 32k disk system.

For the name and address of your nearest VisiCalc dealer, call (408) 745-7841 or write to Personal Software, Inc., 592 Weddell Dr., Sunnyvale, CA 94086. If your favorite dealer doesn't already carry Personal Software products, ask him to give us a call.



PERSONAL SOFTWARE

CIRCLE INQUIRY NO. 60

VisiCalc was developed exclusively for Personal Software by Software Arts, Inc., Cambridge, Mass.

TM—VisiCalc is a trademark of Personal Software, Inc.

*Apple is a registered trademark

LETTERS TO THE EDITOR

ADVERTISING ERROR

Dear Editor:

The advertisement for Intelligent Systems Corporation on page 69 of the December 1979 issue mentioned the availability of a FORTRAN IV compiler for use on the Intecolor 8063 at $79.95. This was a typographical error and not in accordance with the 9/1/79 Intecolor price list cost of $150, as published in October and November 1979 issues of various magazines.

The Marcus Group/ISC
Atlanta, GA

COMPUTERS AND EDUCATION

Dear Editor:

In response to Donald R. Scherer's article (October, 1979) on the micro at the university level, I have several comments. There is, of course, a need for a computer science department at the university level just as a good university must have a philosophy department, a modern language department, even a biology department; however, there is also a need to introduce *all* university students to computers, especially, in my opinion, to microcomputers.

At most colleges and universities the use of computers (micro, mini or mainframe) is restricted to students in computer science courses. The implementation of the single board 900 at Seton Hall sounds excellent for those individuals who need to 'get into the guts' of computers — students in the computer science curriculum — but what of the others?

Why not micro-based word processing for those in English courses? Or talking micros for modern language? Or micro-interfaced lab equipment for science courses? The technology is here; it is cheap; and the software is around. (However difficult it may be to find the software.)

If we at the university level are doing our jobs, educating our students, we must get the micro out of the computer science laboratory and into the everyday classroom.

Lest I sound like just a talker, our department has committed itself to this goal. Currently, all students in General Biology Laboratory use the computer as part of their regular lab work. This as a result of an NSF LOCI grant (1977). We have only just begun, but all students in biology at our colleges do have a taste of what the computer can do in biology. I would be interested in hearing from other individuals who are using micros (especially Apples) in their labs.

Michael Callery, Instructor Biology
Manhattan College
Riverdale, NY 10471

LOWER SOFTWARE COSTS

Dear Editor:

I am becoming concerned about the rising cost of good microcomputer software. Being an Analyst/Programmer on a large system, I understand that it takes a lot of time to produce good software.

But, being a computer hobbyist, I cannot afford $200-$500 for a word processor, $400 for FORTRAN or $625-$850 for COBOL. Although there is some good software in the $100 and under range, many of the newer packages are way above this figure.

I would like to get the software vendors' feelings toward the purchasing of programs by hobbyists clubs. We could afford to order the more expensive software if the cost could be spread among the members. The way it is now, nobody buys it because of the cost; or they may buy it under one person's name and share it among the group.

I'd like some opinions on this idea.

John Gill
P.O. Box 711
Kingsport, TN 37662

WHAT DID YOU SAY?

Dear Editor:

As a novice to the subject of minicomputers, but as one who has long been interested in the English language, could you briefly but clearly explain what the expression "to boot up," or "bootstrap operation" means in a computer program article? I read through several articles where one or the other expression, or both, occurred, yet I could find no explanation of its meaning.

My thanks and my appreciation for your clarification.

Wilfrid G. Lofft
Orangeville, Ontario, Canada

To boot a system is quite literally to kick it with a piece of software to get it to wake up. The "booting" process advises the CPU and all the other chips that control input/output operations to be ready to accept information.

When you boot up say, a TRS-80, the special software called a monitor sets up certain electronic switches that cause the machine to either load from an on-board piece of software (i.e. BASIC on ROM) or to load a special operating system from disk.

In the future we will attempt to define terms that might confuse new users.

ON BUSINESS SOFTWARE REVIEW

Dear Editor:

I would like to congratulate Carl Heintz for his analysis of the CP/M operating system in his Business Software Review column in the November 1979 issue.

I think that it is long overdue for someone to stand up and tell Digital Research that while their system may be good, they are doing nothing to help the average guy install it on his computer. I know because I speak from experience.

I have a Micropolis. I attempted for over a month to get the system configured, reading Digital's manuals. I finally had to have someone who was expert in CP/M come down to do it. Because of this experience, I have yet to purchase any programs that operate under CP/M or even to experiment with it.

We're looking for the most original use of an Apple since Adam.

What in the name of Adam do people do with Apple Computers?

You tell us.

In a thousand words or less.

If your story is original and intriguing enough, you could win a one-week all-expense paid trip for two to Hawaii. Which is the closest we could come to paradise.

Win fabulous prizes for creative writing.

To enter, drop by your nearest Apple dealer and pick up an entry blank. Fill it out. Then write an article, in 1000 words or less, describing the unusual or interesting use you've found for your Apple.

A jury of independent judges will cast the deciding vote for the grand prize: a week for two, airfare included, in Hawaii.

The judges will also choose 16 additional winners, two each from eight categories: graphics/music, entertainment, home, business, education, scientific, professional, and industrial. And each winner will choose from a long list of longed-after Apple peripherals—from Apple Disk II's to Graphics Tablets to printers. Or you can take a $250 credit towards the purchase of any Apple product.

The contest ends March 31, 1980. All winners will be notified by May 15.

Entry forms are available at your participating Apple dealer. Call 800-538-9696, (800-662-9238 in California), for the one nearest you.

Mail the entry blank, your article and any photos to: Apple Computer, "What in the name of Adam" contest, 10260 Bandley Drive, Cupertino, CA 95014.

And may the juiciest application win.

apple® computer

CIRCLE INQUIRY NO. 4

As a CPA I would hope that I have some abilities to understand computer manuals that are written in some degree of the English language. For all the good CP/M is doing me, however, it might as well have been written in Greek. Until Digital and its distributors learn this, I think that I will stick to my Micropolis BASIC which is written in a level of English that I can understand.

I hope that you and Mr. Heintz continue to review programs designed for businesses with a critical eye intended to tell the businessman where he is going to have problems with a certain program. His telling us what programs are good and their strong points is also beneficial.

On that note, I would like to second his recommendation on the CCA Data Management System as his analysis is 100% correct. I would hope that he also take a look at Systemation, Inc.'s BEM-1 program. I find that it has been a useful tool in my programming and debugging process.

Thomas L. Genung, CPA
Glenwood, IA

A XITAN PROBLEM

Dear Editor:

Your brief article "What Happened to Xitan" in the November 1979 issue caught my attention. For six months we have been attempting to get a response from them in regard to an overcharge of $80 which we paid on a C.O.D. purchase.

I would be pleased to submit complete information to the appropriate persons if this would be relevant to the present investigation of their procedures. Do you have an address of someone to whom I might provide this information?

Robert E. Kingman
Berrien Springs, MI

Persons with problems regarding Xitan should contact Sgt. John Coroy at the Hanson, Massachusetts, Police Department, (617) 294-8081. He is in charge of the Xitan situation.

LOOKING FOR ASSISTANCE

Dear Editor:

I have an 8K PET that I am using for marketing statistics. It would be much more versatile if I could access our corporate shipped history file in the IBM 360/50, dump it once a month into floppy disk for sorting as required through the PET.

Perhaps one of your readers could help.

Donald F. Ward, Mgr. Mktg. Stat.
Altec Corp.
1515 S. Manchester Ave.
Anaheim, CA 92803

Dear Editor:

I have a Texas Instrument 58 programmable calculator and a PC-100A printer also of their make. The printer is capable of printing a graphic output, but for my purpose the graphs are too small.

I have a 12" Zenith television that I am not using. The thought occurred to me to interface the TI-58 to the television.

Would you inquire through the media of your magazine for a company or individual who would know how this can be done?

R. A. Walkinshaw
1520-143 E. Capitol Expy.
San Jose, CA 95121

Dear Editor:

I have an S-100 (or Altair 100) bus computer and would like to install core memory in it. I have been unsuccessful in locating anyone marketing such a device. I would greatly appreciate any information on the subject.

If no one is manufacturing S-100 core, where might I locate core planes that I can interface to the S-100 bus?

Larry Smith
R & L Enterprises
2901 Willens Dr., No. 6
Melrose Park, IL 60164

Dear Editor:

Our school district is currently implementing the usage of microcompuers for C.A.I. We currently are using Apple and Radio Shack TRS-80 computers. We are seeking software in the areas of:

1. Remedial Math, Reading, and Language instruction
2. English as a second language
3. Simulations for mentally gifted minor students
4. Vocational training & career guidance

We will be grateful for any help you can give us.

Richard R. Castello
Director Special Projects
N. Monterey County Unified School Dist.
11161 Merritt St.
Castroville, CA 95012

FEELING LEFT OUT

Dear Editor:

I was sorry to see that you did not include the Shinshu Seiki TX-80 Printer in your November issue. The all metal cabinet encloses a great dot matrix printer capable of 150 cps and 70 lpm. The tractors are adjustable on both sides and will handle up to 10" paper. Interfaces for the Apple II, PET 2001, TRS-80 and most other systems are available from the manufacturer.

The printer comes with upper and lower case as well as graphic characters. Expandable characters are also available in the standard unit. The ruby jeweled head mechanism gives the printer a head life of 100 million characters and the MTBF is over 7 million lines.

Its size, durability and price (lists under $900) make it great for personal and small business use.

J. Hardt
Haledon, NJ

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HAPPY WITH MOD I

Dear Editor:

After reading the letter by Mr. Davidson in the November issue concerning his awful experience with the TRS-80, I thought perhaps your readers should hear from someone who has not had any serious problems with his TRS-80.

I have now had my TRS-80 for fifteen months. I have the same configuration as described in Mr. Davidson's letter; that is, 32K Level II with two drives. My only hardware problem was present when I first received the machine. This was poorly aligned key switch contacts in the keyboard. This was easily corrected by simply realigning the faulty contacts. My other problem was most irritating but not due to hardware. This problem was a consistent "LOST DATA DURING READ" error while using the TRS-DOS version 2.1. For the past four months I have been using Appart's NEW-DOS and have had no more disk errors. TRS-DOS version 2.2 also corrected the disk error, but I prefer to use the NEW-DOS. These are the only two problems that I have had with my TRS-80.

I might add that although my TRS-80 is used daily, I am virtually the only user and am very careful to not abuse my machine. Perhaps in a classroom with many people using the machine, failure would be more likely.

The shortcomings that I do find in the TRS-80 are mostly trivial. For instance, I would like a separate control key and multiline functions. On the other hand, I think Level II is the best of the small machine BASICs. Since I use the computer mostly in dealing with numbers, the 16-digit precision is especially nice.

Besides BASIC, I am now also successfully running FORTH and FORTRAN on my TRS-80. As with BASIC, the operation is flawless. I am happy. . .I think I got a good buy.

Truman Krumholz
Springfield, MO

NEEDS APPLICATIONS

Dear Editor:

Can you help me locate suitable material for my students?

I would like to find simulation games in Sales, Marketing, Small Business Management, International Trade, etc.

My students are frequently involved in conducting market surveys for individual firms and community groups. There must be software materials around that can help us here.

Most of my students are first and second year college. However, high school materials will be entirely satisfactory.

Though some of my students will be taking a computer programming course in another area of the college, most of them will have had no background.

Any thoughts, ideas and suggestions you can give me will be very much appreciated.

Jack L. Turley, Coordinator
Management Training
Shagit Valley College
2405 College Way
Mt. Vernon, WA 98273

Every month we offer more business software than can be found anywhere. Also our readers can probably supply you with a complete library of important applications.

REQUEST FOR HELP

Dear Editor:

Does anyone out there know how to get rid of the reset button on the TRS-80? Does anyone know how to get rid of the break key on the PET 2001?

If so, please write me. The TRS-80 I'm working with is Level II/16K. The PET 2001 is brand new and has 8K.

Ashley Weech
411 Miami Ave.,
Terrace Park, OH 45174

Ashley, we are printing your letter along with several others this month requesting information or assistance. Perhaps there are readers out there who can help you.

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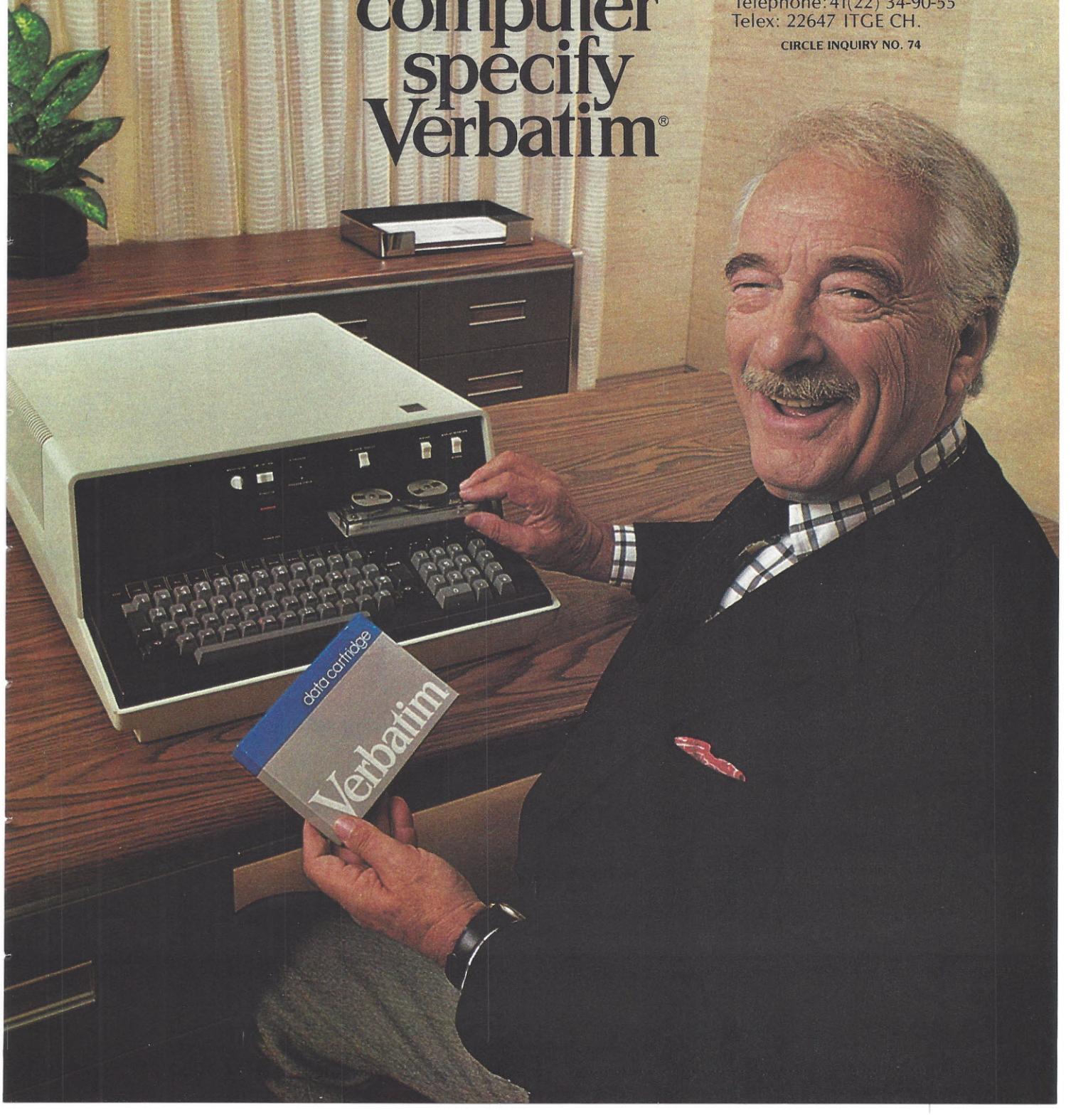
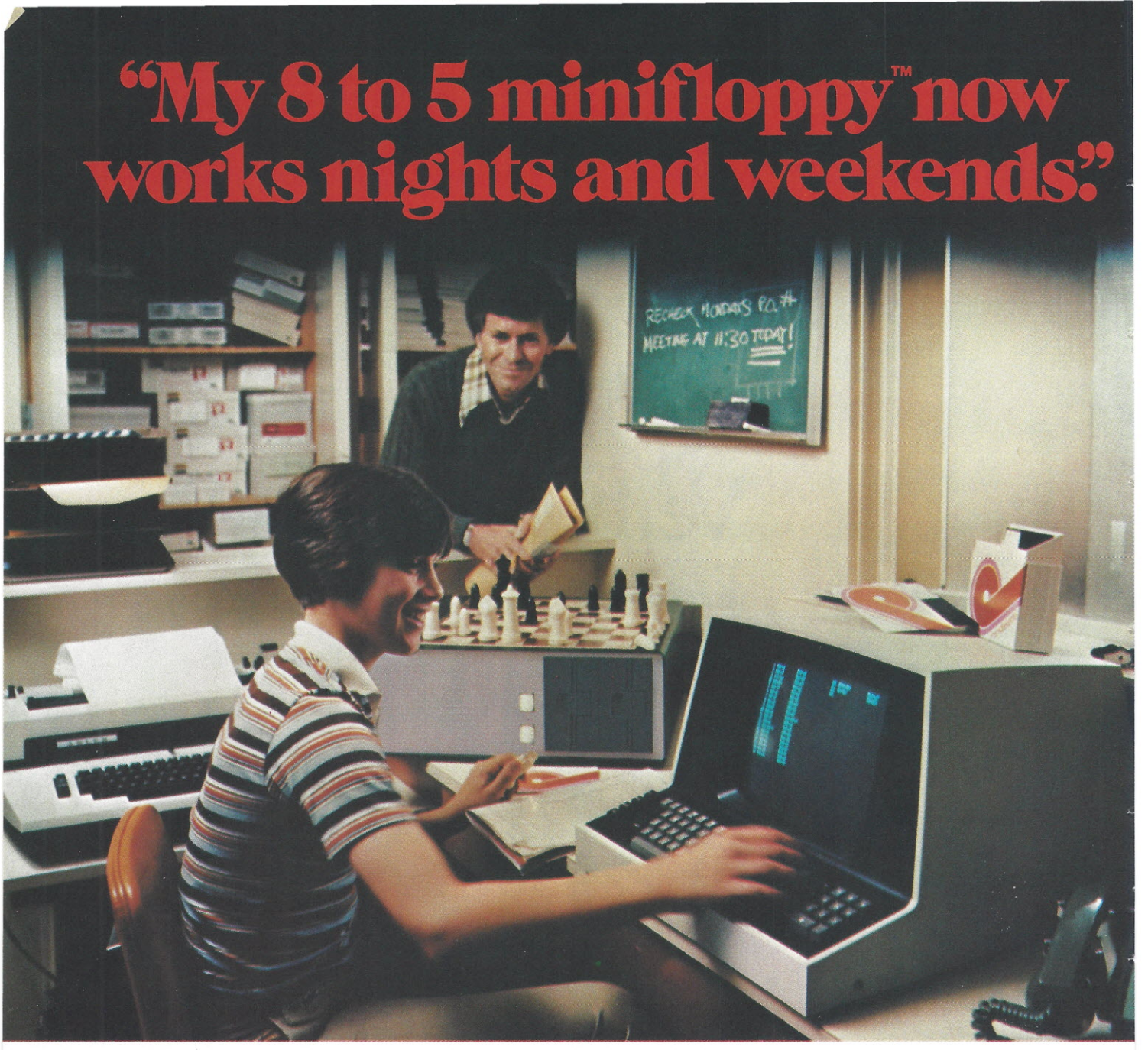
CIRCLE INQUIRY NO. 74

people who play the computer specify Verbatim®



"My 8 to 5 minifloppy™ now works nights and weekends."



"I own a fast-growing business and before I bought my computer system I put in a lot of late hours keeping up with my accounting and inventory control. Now the computer does my number crunching quickly, so I have time after hours to have some fun with the system. My son and I started out playing Star Trek on the system, and now we're learning to play chess.

"When I was shopping around for my system, the guys in the computer stores demonstrated all the unique features of the minifloppy. I've got to admit that at first I didn't really understand all the technical details. But now that I use the system every day, I really appreciate the minifloppy's fast random access and data transfer. I like the reliability, too.

"I'm glad I went with Shugart drives. Look, when you lay out your own money for a system, you want dependable performance and good value. Do what I did. Ask for the system with the minifloppy."

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See opposite page for list of manufacturers featuring Shugart's minifloppy in their systems.

TM minifloppy is a registered trademark of Shugart Associates

CORRECTION FROM SEATTLE

Dear Editor:

We at Seattle Computer Products appreciate your mention of our new products in the December Editor's Notebook. However, our new 16-bit memory card is not Dynamic as stated, but fully Static (as the use of a 4044 would imply).

What is dynamic is the data bus width, which is either 8 or 16-bits, depending on the state of the new IEEE Standard's sXTRQ line (pin 58), at time of data transfer.

Tim Paterson
Chief Engineer
Seattle Computer Products
Seattle, WA 98188

A HELPFUL SHORT PROGRAM

Dear Editor:

Enclosed is a subroutine for dynamic print using. This routine is considerably faster than the Microsoft edition, but not as universal, of course.

If it, in your opinion, may interest your readers, please feel free to publish it in your magazine.

H. Bram Hansen
Bakkedraget 55, Europe

Program Listing below

```
------ PRINT USING FOR DOLLARS AND CENTS -------

10 REM YOUR MAIN PROGRAM HERE - DEFINE CONSTANTS:
20 B$=" ":D$="$":L=10:Z$="0":ZZ$=".00":D=10:DD=100
30 REM     HERE COMES YOUR PROGRAM
40 REM     ENDING UP WITH THE NOT-ROUNDED VALUE IN VARIABLE V
50 REM     SUBROUTINE STARTS AT LINE 2000
60 REM     CHANGE L TO 12 IF MILLION DOLLAR BIZ
80 REM     HERE COMES A SAMPLE PROGRAM
90 T=0
100 FOR I=1 TO 10
110 V=D*DD*RND(1)-200
120 GOSUB 2000
130 PRINT"ITEM NO."$I$TAB(20)$K$
140 T=T+KT
150 NEXT I
160 FOR I=1 TO 30:PRINT"-";:NEXT I:PRINT
170 V=T:B$="*"
180 GOSUB 2000
190 PRINT"TOTAL"$TAB(20)$K$
200 B$=" ":REM RESET B$ TO BLANK
1990 END:REM END OF MAIN PROGRAM
2000 KS=INT((V+5E-03)*DD):REM ROUND OFF
2010 KT=KS/DD:REM BOTH KS AND KT ARE USED
2020 K$=STR$(KT):IF V<0 THEN 2030 ELSE K$=RIGHT$(K$,LEN(K$)-1)
2030 KU=INT(KS/D):KV=INT(KS/DD)
2040 IF INT(KS-DD*KV)=0 THEN K$=K$+ZZ$:GOTO 2060
2050 IF INT(KS-D*KU)=0 THEN K$=K$+Z$
2060 K$=D$+K$:REM PUT $ SIGN IN FRONT
2070 IF LEN(K$)<L THEN K$=B$+K$:GOTO 2070
2080 REM    FILLED UP NOW WITH BLANKS TO THE LEFT
2090 RETURN:REM    END OF SUBROUTINE

RUN
ITEM NO. 1              $45.12
ITEM NO. 2             $105.00
ITEM NO. 3             $111.87
ITEM NO. 4             $315.16
ITEM NO. 5            $-141.69
ITEM NO. 6             $588.89
ITEM NO. 7             $297.10
ITEM NO. 8             $163.75
ITEM NO. 9             $784.55
ITEM NO. 10            $701.59
--------------------------------
TOTAL                **$2971.34
Ok
RUN
ITEM NO. 1             $527.31
ITEM NO. 2            $-193.17
ITEM NO. 3             $769.43
ITEM NO. 4            $-198.25
ITEM NO. 5             $756.23
ITEM NO. 6            $-159.23
ITEM NO. 7             $696.61
ITEM NO. 8             $460.21
ITEM NO. 9             $354.49
ITEM NO. 10            $618.67
--------------------------------
TOTAL                **$3632.30
Ok
```

UPDATE

NATIONAL COMPUTER-BASED TOLL-FREE ANSWERING SERVICE

"VOICEGRAM," a nationwide toll-free computer-based answering service, is now available to subscribers of The Source, it has been announced by Telecomputing Corporation of America (TCA).

Businessmen and others can send or receive electronic mail messages when a terminal is not available, making The Source's advanced electronic mail even more valuable. Users simply dial a toll-free number anywhere in the continental U.S. and dictate messages by telephone.

Messages can be retrieved from any terminal, communicating word processor, or personal computer in their office or home, using a nationwide communications network. Subscribers can also call in to receive VOICEGRAM messages sent to them.

VOICEGRAM messages can be up to 100 words long and can be sent Monday through Friday, 9 a.m. to 9 p.m. VOICEGRAMS are entered into the computer and forwarded to addresses within an average of 15 minutes. The charge for each message is $1.25 plus regular connect time charges of five cents a minute (25 cents before 6 p.m.). For multiple addresses, the charge is 75 cents for each additional address.

For details contact Telecomputing Corporation of America, 1616 Anderson Rd., McLean, VA 22102, (703) 821-6660.

COMPUTER SERVICES MAINTENANCE

Rockefeller University recently selected Grumman Data Systems Corporation to supply maintenance for 24 mixed-vendor minicomputer systems at its research facilities in New York City. The maintenance effort will include full-time engineering support and spares inventories for the systems.

The Electronic Systems Maintenance (ESM) group of the Grumman organization had to bid competitively against the manufacturer and eleven other suppliers by third-party maintenance in order to be chosen.

As a third-party contractor, Grumman accepts responsibility for maintenance of all the hardware in a system, regardless of the manufacturer. ESM provides quick response, qualified service engineers, local spares inventories and emphasis on preventive maintenance.

PCC AND TRIUMPH ADLER AGREE ON ACQUISITION

Ryal R. Poppa, Chairman of the Board, President and Chief Executive Officer of Pertec Computer Corporation (PCC), announced that a definitive agreement has been entered into under which PCC will be acquired by Triumph Adler of West Germany for $16.50 per outstanding share of PCC common stock.

The acquisition will be accomplished through a cash tender offer by a United States subsidiary of Triumph Adler, to be followed by a cash merger, according to Poppa.

The tender offer and merger will be subject to the satisfaction of various conditions, including, in the case of the tender offer, tender of a majority of PCC's outstanding shares. Poppa stated that Triumph Adler had advised that no West German exhange control or other approvals remain to be obtained.

Triumph Adler, based in Nuremberg, West Germany, manufactures and markets business computers, word processing equipment, copy machines, typewriters and other business machines.

Pertec Computer Corporation designs, manufactures, markets and services digital magnetic tape transports, rigid disk drives, flexible disk drives, controllers and small computer systems for distributed processing, clustered processing and small business systems applications.

ENGINEERING PROJECT MANAGMENT COURSE

Integrated Computer Systems (ICS) has recently added a new course, *Engineering Project Management,* designed for project managers, general and line managers as well as project team members who are involved in planning, design and execution of advanced technology projects.

The four-day course presents a comprehensive analysis of project development, provides a systematic management methodology and a set of practical implementation tools and techniques.

The course will be taught in major cities throughout the United States and Europe. For details contact Integrated Computer Systems, 3304 Pico Blvd., P.O. Box 5339, Santa Monica, CA 90405, (213) 450-2060 or TWX 910-343-6965.

JOINT EXHIBITION 80

The Information Processing Joint Exhibition 80, in Tokyo, which will combine the exhibitions of the Eighth World Computer Congress and Medinfo 80, will have the support of four major associations and ten Japanese governmental departments and private organizations.

The Eighth World Computer Congress, also known as IFIP Congress, is an event held every three years and is accompanied by an extensive exhibition. Medinfo 80 is an international conference on information for the medical profession and data processing professionals with a special interest in medical computing.

The Information Processing Joint Exhibition 80 will take place at the Tokyo International Trade Center (Harumi) October 3-8, 1980. It is combined with the Data Show, an annual computer exhibition normally limited to Japanese exhibitors.

Information about exhibit space may be obtained from Expoconsul, 420 Lexington Ave., New York, NY 10017, (212) 953-1190. Information about the Congress and its technical program, registration procedures and housing may be obtained from the American Federation for Information Processing Society (AFIPS), 1815 N. Lynn St., Arlington, VA 22209, (703) 243-4100.

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CIRCLE INQUIRY NO. 13

the Column

By Jack Purdum, Ph.D.
Ecosoft
P.O. Box 68602, Indianapolis, IN 46268

I'm sure most readers could tell a story of how a computer was used by an employee to commit a crime. Most of the examples would probably involve the use of large computers. However, as the microcomputer gains greater acceptance in the business community, we will begin to hear more and more horror stories about how micros were involved in business crimes. Since everyone is not honest (except you and me), most applications software for microcomputers use a password to prevent unauthorized employees from having access to "sensitive" programs. While the use of a password is a step in the right direction, it has one serious flaw; it's too easy to get around the password.

Suppose, for example, that you are using a password for your firm's payroll program and it is stored on a disk under an assigned variable, N$. When the program is started, the file is read and upon completion, N$ contains the appropriate password. The program will then prompt the operator for the password which they enter as, let's say, T$. The program then compares T$ to N$ for a match. If no match is found, the program is terminated.

It is at this point that anyone who is familiar with BASIC can use that knowledge to defeat the password. All the operator has to do is use the LIST command and see what variable has been assigned to the password (N$ in our example). Since most versions of BASIC allow for direct PRINT commands, all the operator has to do is enter PRINT N$ and the password is printed for all the world to see.

While some software uses a "scrambling" technique that uses an equation to scramble and unscramble the password, the same problem remains: given enough time and the ability to see the equation, the operator can decode the password.

The simple fact is that no method of protection is going to be absolutely secure. The best that one can hope for is to make the task of defeating the password as difficult and time-consuming as possible. The discussion that follows presents a technique that is simple to implement, yet increases the difficulty of defeating a software password by an order of magnitude.

THE "BLIND" PASSWORD

The following discussion uses North Star BASIC in the example, but there is no reason why it shouldn't work equally well with other versions of BASIC. The reader should have little or no difficulty changing the program to their particular form of BASIC.

The main idea behind the technique is that, if the operator must list the source code of the program (i.e., the BASIC program listing), it is going to be significantly more difficult to determine the password. This suggests that it might be desirable to go into the BASIC interpreter and "remove" the LIST command. This is probably the wrong approach for two reasons.

First, it is the H bomb-to-kill-an-ant approach to the problem. It would involve a considerable amount of work for a skilled programmer to remove the command. Second, there will be times when there are legitimate reasons for listing the program. For these reasons, we will take a simpler approach to the problem; namely, changing the LIST command itself.

The concept for the change is quite simple. Each BASIC interpreter has a list of "keywords" or "reserved" words that cause the interpreter to execute a given function. The LIST command causes the source code to be displayed on the monitor and is a reserved word in most BASICs. If, for example, we change the LIST command to FROG, anyone who tries to list the source code of the program by entering the LIST command will instead see an error message displayed on the screen. (For North Star BASIC, the message is SYNTAX ERROR.) However, if the operator knows that the LIST command is now FROG, entering the word FROG will cause the source code to be displayed on the screen in the normal manner. In essence, FROG has become the LIST command's reserved word.

If the operator must list the source code, it is going to be significantly more difficult to determine the password.

The advantage should be obvious: unless the operator knows the new reserved word for the LIST command, he cannot directly list the program, thus making the password "blind" to the operator. This will substantially increase the difficulty associated with defeating the password.

IMPLEMENTING THE NEW RESERVED WORD

Implementing a new reserved word for the LIST command involves two steps; 1) locating the original reserved word in the BASIC interpreter and 2) changing it to the new, user-defined reserved word. The program presented here does exactly this.

The first part of the program (lines 60-220) takes the beginning and ending hexadecimal memory addresses of the BASIC interpreter and converts them to their decimal equivalents for later use in the program (e.g., line 340). This confines the search to the section of memory occupied by the interpreter.

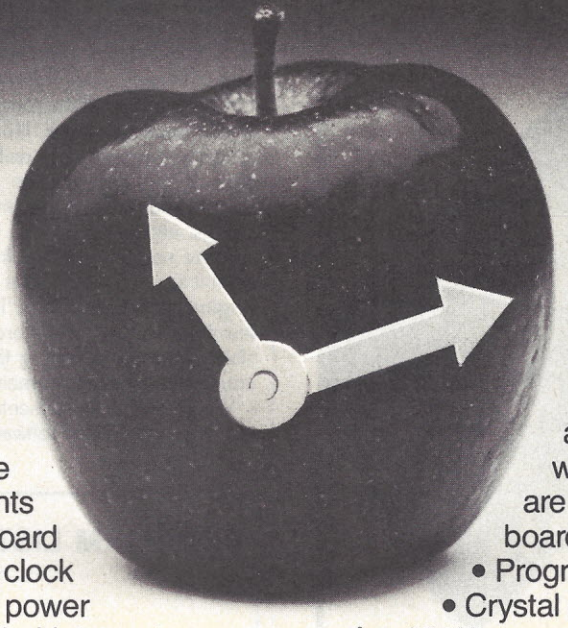
The user is then asked to enter the reserved word that is to be changed (line 260) and then what new word will be substituted for it (line 270). Note that the new reserved word must contain *exactly* the same number of letters as the one it replaces. Also, the new word should not contain numeric characters. While it would be possible to modify the program to include numbers, this is left to the reader.

Even without the use of numbers, a four-letter reserved word will still have over 450,000 possible combinations (no one said the word has to actually "spell" anything). At the rate of 10 combinations/second, it would still take more than 12½ hours to test all possible combinations. Hopefully, someone would catch on before that. (There is no reason, if you are so inclined, why you could not change the reserved word on a daily basis.)

After the new reserved word is entered, the program searches the area of memory that contains the interpreter for a match between the reserved word entered in line 260 and its corresponding ASCII equivalent. If a match is found, line 400 prints the address of the first letter of the reserved word in decimal. The program then proceeds to change the original reserved word to the new word entered by the user. The change is made in lines 470-520. For those not familiar with North Star BASIC, the EXAM and FILL commands are the same as PEEK and POKE in other BASICs.

NEW FROM MOUNTAIN HARDWARE.

THE APPLE CLOCK.



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Until now, there hasn't been a Real-Time Clock for the Apple II*. The Apple Clock from Mountain Hardware keeps time and date in 1mS increments for over one year. On-board battery backup keeps the clock running in the event of power outage. Software controlled interrupts are generated by the clock. That means you can call up schedules, time events, date printouts ...all in real time on a programmed schedule.

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The Apple Clock is easily accessed from BASIC using routines carried in on-board ROM. With it, you can read time and program time-dependent functions for virtually any interval. From milliseconds to days, months or a year.

PLUG IN AND GO.
Plug the Apple Clock into a peripheral slot on your Apple II and you're ready to go.

FEATURES.
- Time and date in 1mS increments for periods as long as one year.
- Software for calendar and clock routines, as well as an event timer are contained on on-board ROM.
- Program interrupts.
- Crystal controlled accuracy of ±.001%.
- On-board battery backup keeps your clock in operation even during power outage.

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At $199 assembled and tested, it's the clock your Apple has been waiting for. And, it's available now through your Apple dealer. Drop in for a demonstration. Or return the coupon below.

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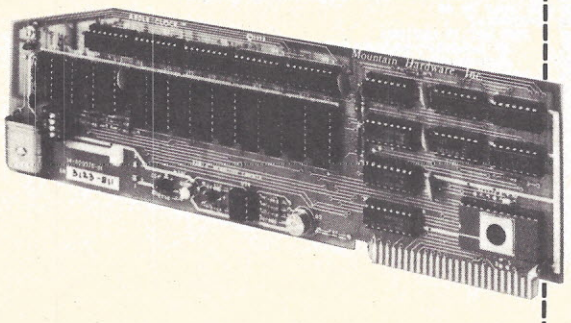
Mountain Hardware also offers a complete line of peripheral products for many fine computers.



Mountain Hardware, Inc.
300 Harvey West Blvd., Santa Cruz, CA 95060
(408) 429-8600
Sounds great.

_____ Send me everything I'll need to know about the Apple Clock.
_____ I've got a _____ computer. Send me information.

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*Apple II is a trademark of Apple Computer, Inc.

SOME FINAL THOUGHTS

After the program has run to completion, try the new reserved word to make sure it functions as it should. If LIST is entered, you should see an error message. If the new reserved word is entered, the program should be displayed on the screen. Assuming that it functions as it should, and assuming that you are using North Star BASIC, you should rerun the program and change the EDIT reserved word as well. The reason is that, if the operator stops the program at the point where the password is to be entered by entering a Control-C, North Star BASIC prints the line number where the program execution stopped. If the EDIT command is still "intact," the operator could use the EDIT command to list that particular line. Changing the EDIT command will prevent this. If you do make multiple changes, make sure that no two reserved words are the same.

Lastly, note the message in line 330; the program does run slowly. Using a 4MHz clock and Release 4 North Star BASIC, it takes about one and a half minutes for the program to find and change the LIST command. If the program were written in assembly language it would run much faster. However, since most people will not be running the program on a daily basis, the slowness is probably acceptable. (For those who do assembly language programming, with minor modifications, the program could be used to locate op codes, strings, etc.)

Once you are satisfied that the changed BASIC performs as you want it to, you should save the new version on a new disk (leave the original version as it was). This new disk should then be used for system initialization. The words can be changed back to their original state by simply reversing the process mentioned above. It does, of course, assume you remember the new reserved word.

While the method presented here is not foolproof, it should help protect your applications software to a greater degree than it was before.□

PROGRAM LISTING

```
10 REM THIS PROGRAM CHANGES A 'BASIC' COMMAND WORD TO A USER-DEF COMAND WORD
20 Z9$=CHR$(27)+'*'\!Z9$\!\REM Z9$ CLEARS SCREEN
30 REM=====================================
40 REM *CONVERT HEX TO DECIMAL FOR LOOP*
50 REM=====================================
60 G1=0
70 !\INPUT1'WHAT IS BEGINNING HEX ADDRESS OF 'BASIC': ',N$
80 IF LEN(N$)=4 THEN 100
90 !\!'MUST BE A 4-DIGIT NUMBER.RE-ENTER.'\GOTO 70
100 J=1
110 L=LEN(N$)
120 FOR I=1 TO 4
130  A(I)=ASC(N$(J,J))-48
140  IF A(I)>9 THEN A(I)=A(I)-7
150  J=J+1
160 NEXT I
170 A=4096*A(1)+256*A(2)+16*A(3)+A(4)
180 IF G1=1 THEN 220
190 A1=A\REM A1=BEGINNING DECIMAL ADDRESS OF 'BASIC'
200 !\!\INPUT1'WHAT IS ENDING ADDRESS OF 'BASIC': ',N$
210 G1=1\GOTO 100
220 A2=A\REM A1=ENDING DECIMAL ADDRESS OF 'BASIC'
230 REM=====================================
240 REM *INPUT OLD AND NEW WORD FOR SEARCH*
250 REM=====================================
260 !\!\INPUT1'WHAT IS WORD TO BE LOCATED! ',W$
270 !\!\!'WHAT IS NEW',LEN(W$),'-LETTER WORD! ',\INPUT1'',T$
280 IF LEN(T$)=LEN(W$) THEN 330
290 !\!\!\!\!'MUST BE ',LEN(W$),' LETTERS. RE-ENTER.'\GOTO 270
300 REM=====================================
310 REM *NOW LOOK FOR MATCH IN 'BASIC'*
320 REM=====================================
330 !Z9$\!\!'THIS MAY TAKE A WHILE, SO BE PATIENT.'
340 FOR J=A1 TO A2
350  B=EXAM(J)
360    FOR K=1 TO LEN(W$)
370      IF CHR$(B)<>W$(K,K) THEN EXIT 420
380      B=EXAM(J+K)
390    NEXT K
400  !\!\!\!'MATCH IS FOUND AT ADDRESS',J,' (DECIMAL).'\!
410  EXIT 470
420 NEXT J
430 !Z9$\!'NO MATCH FOUND.'\END
440 REM============================
450 REM *CHANGE OLD TO NEW WORD*
460 REM============================
470 FOR I=1 TO LEN(W$)
480  B=ASC(T$(I,I))
490  FILL J,B
500  J=J+1
510 NEXT I
520 END
```

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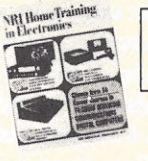

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CALENDAR

POLYTECHNICA WORKSHOPS

Three workshops from Polytechnica Institute will be held January 17-19 in Arlington, Virginia; February 4-6 in Savannah, Georgia and March 20-22 in Dallas, Texas.

Each is a three day Hands-On Microprocessor Peripherals Workshop with a nominal cost computer take-home option. Registration fee is $795.

For details contact Paul A. Willis, (703) 533-2826 or Polytechnica Institute, P.O. Box 29, Arlington, VA 22210.

MICROPROCESSORS IN SYSTEM DESIGN

A seminar for upper and middle management, systems analysts, project managers, design engineers and engineering support staffs, who find that microprocessor-based systems and subsystems are playing an increasingly larger role in their specialties will be offered by the Institute for Advanced Technology on January 21-23 in San Francisco.

Microcomputer units will be used to provide practical experience with the capacity of microprocessors to solve specific design problems.

For more information contact Darlene Promowicz, Registrar, Institute for Advanced Technology, 6003 Executive Blvd., Rockville, MD 20852.

MICROCOMPUTERS & PHYSICS

The joint meeting of the American Association of Physics Teachers and the American Physical Society to be held at the Chicago Marriott Hotel, January 21-24 will have several sessions dealing with microcomputers and instrumentation.

Included are all-day workshops on "Introduction to Microprocessors," and Pascal programming language, and a hands-on session "The Use of Personal Computers in Learning Physics."

For more information contact American Association of Physics Teachers, Graduate Physics Bldg., SUNY at Stony Brook, Stony Brook, NY 11794, Attn: Joint Meeting, (516) 246-6840.

STRUCTURAL ANALYSIS & TESTING SESSION

Structural Analysis and Testing will be the subject of a one-week learning session featuring instructors from academia and industry. Instructional laboratories plus evening demonstrations of equipment by manufacturers will also be part of the session.

The courses will be held January 21-25 at the MGM Grand Hotel in Reno, Nevada.

Registration fee is $695 per person. Details are available from Onstead & Associates, Inc., 1333 Lawrence Expwy., Bldg. 100, Suite 103, Santa Clara, CA 95051, (408) 246-7656.

VOICE & DATA COMMUNICATIONS CONFERENCE

Communication Networks '80, the first major national voice and data communications conference of the decade, will be held on January 28-30 at the Sheraton Washington Hotel.

Technology sessions will bring out the latest in telecommunications by tutorials in new areas such as fiber optics, satellite communications, systems networks and more.

CN '80 is produced by The Conference Company. For more information contact Conference Director William R. Leitch at (800) 225-3080.

DATA ENTRY MANAGEMENT & SUPERVISION SEMINAR

Management Information Corporation's three-day seminar will be held in Cherry Hill, New Jersey, on January 28-30 and March 24-26.

Each seminar will cover such topics as data entry systems concepts, data entry control techniques, personnel motivation and improving data entry productivity. All of the instructors have had experience in managing a data entry department and have encountered many of the problems common to supervisors and managers.

For registration fees and details contact MIC, 140 Barclay Ctr., Cherry Hill, NJ 08034, (609) 428-1020.

SCHEDULE DESIGN COURSE

"Scheduling Work Shifts and Days Off for Employees of Extended-Hours Services" course centers around the design of employee work schedules to meet management's productivity objectives and satisfy employee preferences and needs.

The seminar features hands-on use of new low-cost microcomputers and programmable calculators.

The Institute for Public Programs Analysis will hold this training program February 4-8 in St. Louis, Missouri. For details contact TIPPA, 230 S. Bemiston, Suite 914, St. Louis, MO 63105, Allen Gill, Registrar.

DATA COMMUNICATIONS CONFERENCE & SHOW

Data 80 will be held at the Harbour Castle Hilton Hotel and Convention Centre in Toronto, Ontario, February 12-14. Some of the subject areas will be distributed data processing, digitized voice, fibre optics, satellite transmission and communications hardware and software.

For details contact Jill Carrothers, Conference Coordinator or Laurie Whitsed, Show Coordinator, 2 Bloor St. W., Suite 2504, Toronto, Ontario M4W 3E2.

COMPUTER SYMPOSIUM

A *Small Computer Symposium* will be held on the University of Tennessee, Knoxville campus during the weekend of February 23. The Symposium is sponsored jointly by the MicroComputer Club and the local student chapters of IEEE and ACM.

This symposium will present a forum for the display and discussion of small computers in the areas of hobby, education and business.

All potential exhibitors, whether individual, educational or commercial should contact Mike Sappington, 8 Ayres Hall, University of Tennessee, Knoxville, TN 37916.

WEST COAST SHOW

California Computer Show will be held March 13 at the Inn At The Park in Anaheim, California.

OEM and end-user computer and peripheral products will be exhibited and demonstrated at the show.

For details contact Norm De Nardi, 95 Main St., Los Altos, CA 94022, (415) 941-8440.

COMPUTER FAIRE RESCHEDULED

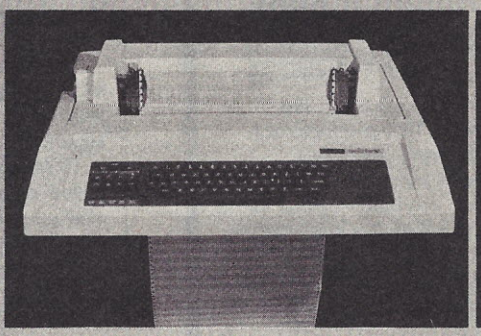
The Fifth West Coast Computer Faire has now been finalized and will take place in San Francisco's Civic Auditorium & Brooks Hall, March 14-16.

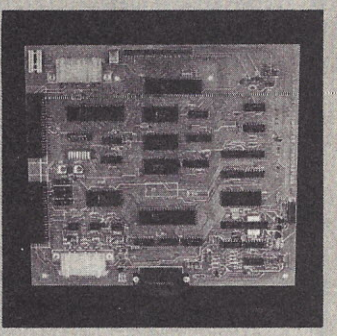
This is a change from an original proposal that the 5th Faire be held in Los Angeles next November — a proposal cancelled some months ago. This is also a change from a more recently announced date in San Francisco.

For more information contact Jim Warren, (415) 851-7075.

Baud News

Published by Datasouth Computer Corporation, 627-F Minuet Lane, Charlotte, NC 28210.





For LA36 Owners, 1200 Baud Breakthrough

CHARLOTTE A spokesman for Datasouth Computer Corp. confirmed reports of LA36 DECwriters® printing at blazing speed. With Datasouth's DS120 Terminal Controller, the LA36 prints bidirectionally at speeds up to 165 cps with true 1200 baud throughput. A 1000 character internal print buffer eliminates the need for fill characters.

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Results Are In

As BAUD NEWS went to press, DS120's were providing enhanced speed and versatility for more than 3000 LA36 owners. The microprocessor-based electronics have proven very reliable, and service, when needed, has been prompt and efficient. Of course, the DS120 comes with a 90-day warranty on materials and workmanship.

Delivered Nationwide

Datasouth reports a network of stocking distributors in major cities throughout the U.S. for prompt service and delivery. The spokesman added that he welcomes inquiries and will gladly give you all the details on the DS120. He can be called at 704/523-8500 or addressed at Datasouth's office, 627-F Minuet Lane, Charlotte, N.C. 28210.

DEC is a registered trademark of Digital Equipment Corporation.
Installation of the DS-120 will void any DEC warranty or service contract.

From the Fountainhead

By Adam Osborne

Nowhere was the change consuming the microcomputer industry more evident than at John Dilks' Personal Computing Show (PCC) which was held in Philadelphia last October. John, as much as anyone, instigated the microcomputer industry explosion beginning in 1976, when with neither the qualifications nor the justification, he pulled off some spectacularly successful shows. "Chutzpah" was what you needed to succeed in the microcomputer industry in those days, and John has as much chutzpah as anyone I have ever met.

But that was a few years ago.

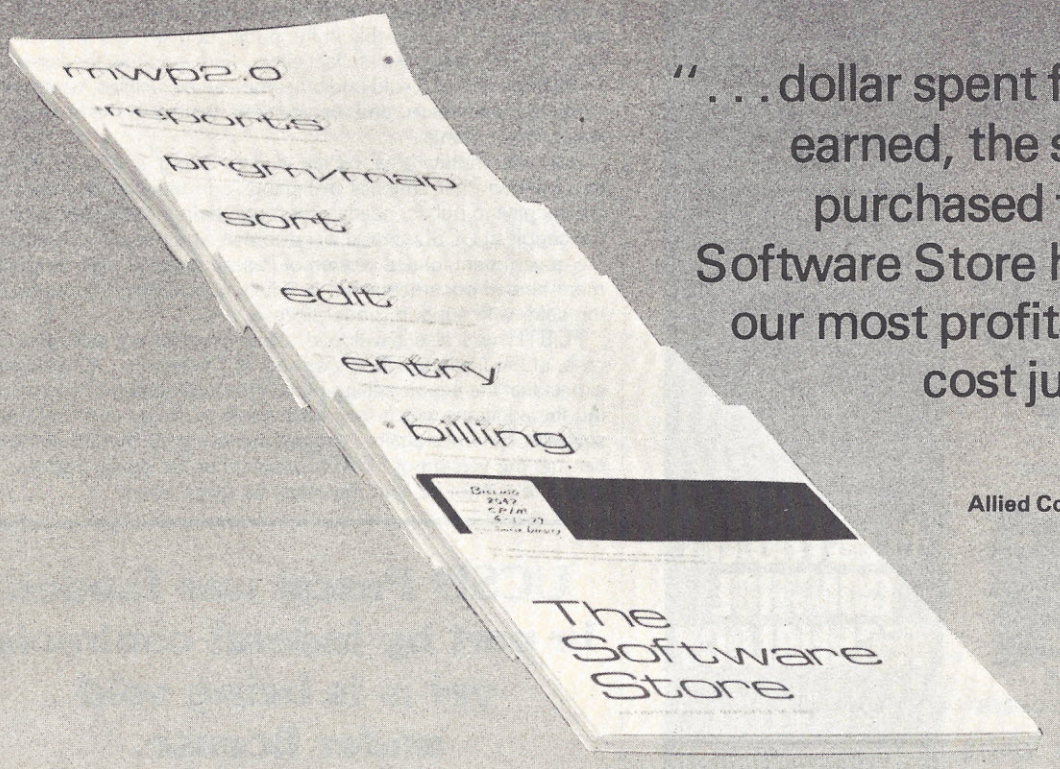
Today you need financial controls, sound management and an understanding of marketing if you want to succeed in the microcomputer industry. These are the same attributes that you need to succeed in any other industry. The microcomputer industry has matured, but very few companies in the industry have matured with it. Those who continued to operate on the basis of chutzpah, rather than management, have gone bankrupt. Those who now continue to operate on the basis of chutzpah, rather than management, will go bankrupt. And this was indeed evident at PCC.

PCC itself is in danger of becoming a casualty. Compared to the last two years, this year's show was poorly attended, with a motley crew of unrepresentative exhibitors and a thin turnout. Of the well-known hardware manufacturers, only Cromemco, Radio Shack, Micropolis and Ohio Scientific were exhibiting. The bulk of the exhibitors were new companies who have never exhibited before, and mail order firms selling over the counter. The majority of successful hardware manufacturers have, presumably, decided to move their exhibits to the established computer industry shows, such as NCC and Wescon. Unless John Dilks can change the image of his show to this more traditional mode, he will likely continue to lose exhibitors and attendees. And therein lies a message for Jim Warren and the West Coast Computer Faire as well.

Despite the shortcomings of John Dilks' Philadelphia show, there were **some interesting exhibitors.** Microbyte was displaying the first real 8086-based system that I have seen. Many have announced, but Microbyte has shown. I was impressed with the Microbyte operation. They are building a quality product. Rather than hawking it for a spectacularly low price as so many misguided manufacturers have attempted to do, they are charging an adequate price, which guarantees a profit margin large enough to finance the type of after-sales support which is now critical to the survival of any hardware manufacturer.

Among the software vendors, MicroPro was present, selling working versions of their Word Star word processing system, together with adequate documentation. I bought a copy of Word Star for my own use. I will report on my experiences with it in a later column. But on the surface, Word Star looks like a very thorough word processing package. It is complex and capable, but that is a two-edged sword. Complex word processing systems cannot be used unless you read the manual. Many operators prefer simple word processing systems that do little or nothing, and do not require them to read a manual.

In a number of recent columns I have discussed piracy problems plaguing the software industry. Many software vendors face bankruptcy because so many of their packages are copied illegally when they should have been bought. But I have discovered that there is a flip-side of this coin. At least some of the **software being sold was developed under government grants** and should, in some variation, be in the public domain, available to all comers at no charge.



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The *application utilities* are the basic building blocks for application program systems. Almost every application can be made of a key-to-disk data entry segment, a file edit segment, a sort/merge segment, a record selection segment and a report & file update segment. These functions are carried out by the ENTRY, EDIT, SORT, SELECT and REPORTS systems, respectively. Application utilities consist of two programs: one for interactive task definition and the other for task execution. Once defined, a task may be executed any number of times or easily revised.

Application utilities permit rapid solutions to satisfy each user's unique requirements. Many first time computer users have built respectable application systems using our utilities and self instructive documentation. Computer stores and consultants utilize our products to generate custom systems for their clients. Because of the flexible and interactive design of the task definition programs, previously defined systems can be easily revised to meet changing needs.

The *systems* are complete packages for a specific application. Systems are fabricated from application utilities together with application specific programs. For example, our Accounts Receivable System utilizes the ENTRY, EDIT, SORT, SELECT and MWP systems along with six special billing system programs.

The MWP system is a complete word processing system with flexible user defined "name & address" files. The "name and address" information and date can be inserted throughout a document. The documents might be reports, manuals, mailing labels, letters or legal documents.

The *system utilities* include programming tools such as the Program Map BASIC cross reference program along with general utilities such as the Disk Fix file recovery program, the Disk Copy (1D & 2D) diskette copy program, the TX-RX file transfer and media conversion programs and the CATALOG diskette library index program.

To find out more about our growing family of software products, contact your local computer dealer for a demonstration or contact us.

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UCSD Pascal, developed at the University of San Diego, was funded at least in part by various federal government contracts. And yet, this product is being sold by the University of California/San Diego under license. Now I doubt if the people at UCSD have attempted to hide the fact that their work was funded by tax dollars, or that parts of it are probably in the public domain; but they have not done much to advertise the fact either. I am sure that the versions of UCSD Pascal being sold under license can be justified, based on the wording of contracts, and/or additions that were made outside of government grants.

But this murky area of tax dollars being spent on software development that enriches institutions and individuals, rather than the tax paying public, needs a thorough airing. If they are to be fair, the people at UCSD should let customers know how they can obtain the government funded version of Pascal, together with the government funded documentation, in addition to buying the product being sold, with support, under license.

FORTH was also developed using government money, in this case, at the National Radio Astronomy Observatory. Once again, I expect that the people selling FORTH would claim that they are selling the additions which they have made to the government funded software. But once again, I suggest that everyone be told where they can get the version of FORTH which is in the public domain, and therefore cannot be sold, but must be given away.

UCSD Pascal was funded in part by federal contracts, yet is is being sold under license.

During the coming year I will make it my business to ferret out software which was developed on government money and is now being sold legally based on contract weasel clauses, or illegally. To those of you who know that the software you are selling was indeed developed largely under government grants, I suggest you tell us all about it before I write about it in this column.

There is another brewing scandal which Carl Warren first brought to the attention of the microcomputer industry, but needs vigorous pursuit: **the bogus consultant.** I have been deeply shocked by the incompetence of many people, claiming to be consultants, who have bought software from my company. Yet these so-called consultants have been unable to handle the small amount of programming we demand that anyone buying our software perform, in order to complete the packages we sell.

Anyone can call themselves a consultant, providing they choose customers more ignorant than they are; they might even get away with it for awhile. But the microcomputer industry will gain for itself a reputation on a par with used car sales and recreational land development if we continue to foster these bogus consultants.

When (and if) the Microcomputer Industry Trade Association becomes a meaningful force within the industry, perhaps it may devise some means of certifying qualified consultants; but in the meantime, I am at a loss as to what we can do. Insofar as customers are concerned, before you buy anything from a consultant, or hire a consultant's services, I strongly urge you to talk with two or more of the consultant's satisfied customers; and make sure, in advance, that the satisfied customer is not an investor with a vested interest in the consultant's success, or an in-law.

Under the category of "We wish you'd tell us about it, fellows," Intel appears to have devised a novel technique for fixing delinquent chips. Recently an Intel 8251 died on one of my engineers. It was a catastrophic failure. On opening up the DIP, a programmer/writer discovered a tiny chip adjacent to the 8251 chip. Either the 8251 in question was pregnant (which I find highly unlikely), or Intel has discovered a new way of fixing defective chips and they're not telling us about it.□

The views in this column are those of the author and are not necessarily those of the magazine or its staff. Dr. Osborne can be contacted at P.O. Box 1234, Cerritos, CA 90701.

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CIRCLE INQUIRY NO. 53

Jurisprudent Computerist

By Leonard Tachner
Attorney-at-Law

As stated last month, this column will now highlight a recently granted patent deemed to be of interest to computer enthusiasts. A segment of the patent will be printed, along with an introduction if required. For an explanation of what each part of the patent description means, see the January Jurisprudent Computerist.

United States Patent 4,025,903

Kaufman et al. **May 24, 1977**

AUTOMATIC MODULAR MEMORY ADDRESS ALLOCATION SYSTEM

Inventors: **Phillip A. Kaufman**, Irvine; **Kenneth C. Gorman**; **George C. Henry**, both of Mission Viejo; **Roy Blacksher**, Santa Ana, all of Calif.

Assignee: **Computer Automation, Inc.**, Irvine, Calif.

Filed: **Sept. 10, 1973**

ABSTRACT

A modular minicomputer is provided which is assembled from a central processor unit module and a plurality of memory modules. Small calculators on the memory modules are so interlocked that when the computer is powered up, memory address boundaries are calculated automatically. As a result, the bank of memory modules appears to the central processing unit the same as a single large memory unit.

43 Claims, 10 Drawing Figures

INTRODUCTION

This invention relates to improved memory systems for modular minicomputers, and more particularly to minicomputers with expandable, flexible memory systems composed of a plurality of memory modules.

As the term is commonly employed, a minicomputer is a general purpose programmable digital computer having a relatively small memory capacity, a processing unit and one or more input/output devices, and a control console.

In the minicomputer of the type to which this invention is particularly applicable, a plurality of memory modules are provided. Each of these memory modules consists of a plug-in printed circuit board which carries an addressable memory unit, local memory processors where needed, and cell selectors that enables the central processor to address only a selected memory cell of a memory unit at any one time. Such a memory processor controls the elements of the memory unit and times the control actions.

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MICROSOFT CONSUMER PRODUCTS

The modular construction of the class of minicomputers to which this invention is particularly applicable, provides a flexible system in which various peripheral units and various memory modules having addressable memory units of different individual, or local, memory capacities, may be plugged into the plug-in connectors, or sockets, in order to provide a minicomputer that meets special requirements of different customers. Some memory modules may be employed which have a long access time or a long cycle time, or both, and which are relatively inexpensive. Other memory modules may be employed which have a short access time or a short cycle time, or both, and which are relatively expensive. For example, where a minicomputer is thus assembled from the modules to provide for rapid, voluminous, I/O operation, an expensive module may be required of low local memory capacity. Some aspects of the invention are applicable even though all the memory modules employ memory units of the same capacity.

Prior Art

In the prior art, the range detectors have been set manually by means of switches located on the modules, thus introducing a danger of human error because of the possibility that the switches may be incorrectly set. A further difficulty arises in such prior art systems because of the fact that if a memory module having one local capacity is replaced by a memory module of another local capacity, then the switches of all the higher order memory modules must be reset. Such a requirement for manual resetting is, to say the least, inconvenient and, for this and other reasons, is also a source of human error.

In still another prior art method, programs are written to take into account the specific arrangement of memory modules with which the program is to be used. However, this introduces an unnecessary complexity because reprogramming may be required if a memory module in one particular connector, other than the last memory module, is replaced by another module having a different local capacity.

BRIEF DESCRIPTION OF THE INVENTION

The improved system for setting the boundaries between contiguous memory modules overcomes the difficulties encountered in such prior systems.

This invention provides a system for automatically setting the range selectors of the respective memory modules of a continuous bank of memory modules, without human intervention, so that the ranges of the addresses are consecutively ordered without gaps and without requiring that the memory modules have predetermined local capacities or a predetermined sequence of local capacities.

In effect, the local memory capacity signal source and the means for setting the address detector of each module comprises a local calculator. According to this invention, these calculators are connected to operate in tandem so that whenever the electric power is turned on and has reached a satisfactory level, these local calculators are operated sequentially, one at a time, by a signal from the prior module in the series so as to automatically set the local range detector of each of the modules to successive contiguous ranges of the total capacity of the memory bank and then to set a total memory capacity register of the processor. The calculators on the memory modules are so designed that

each is ineffective until it reaches a range address signal from the prior module (i.e., processor module or memory module) and are also so designed that when a starting signal is received, a new one is calculated and is transmitted to the next module in series. Thus, in effect, the address boundaries for the memory modules are established by the joint interaction of the processor and the calculators located on the memory modules.

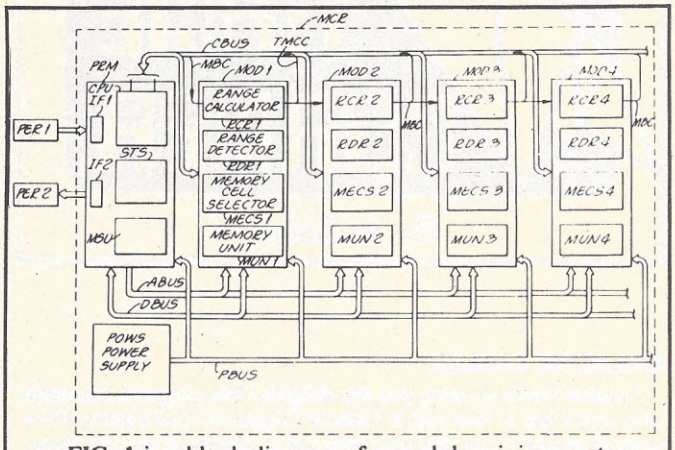

FIG. 1 is a block diagram of a module minicomputer embodying the invention;

30. In a memory system for a digital computer having a series of successively ordered memory modules, address boundary allocation means comprising:

a local memory capacity register in each said memory module, for storing a representation of the memory capacity of said each module, the first module of said series having a predetermined value for its starting address boundary; and

an electrical means interconnecting said successive modules, each said module in the series but the first being responsive to said local memory capacity registers of all prior modules in the series, for automatically establishing a unique starting address boundary for said each memory module.

24. In a method for addressing individual memory cells for selectively storing information therein or for reading out selected information therefrom, the steps of:

providing a series of individual memory modules, each containing a number of such memory cells;

creating in said memory module a memory capacity signal representing the number of memory cells in the memory module;

combining the memory capacity signals corresponding to memory modules prior to each memory module but the first in the series, to provide a signal representing the sum of the memory capacities of said prior modules,

registering a numerical starting address for each memory module to designate a first memory cell address therein in accordance with the sum signal corresponding to prior modules in the series; and

combining the memory capacity signal of each module with the numerical starting address of each module to establish an ending address for each memory module.

Do you like this change of format? Let us know by circling number 111 on the reader service card if you like the column as it is this month. Circle number 112 if you prefer the general interest legal information of the past.

For more information contact the author at Jurisprudent Computerist, P.O. Box 1234, Cerritos, CA 90701.□

AL BAKER'S GAME CORNER

By Al Baker

GALACTIC GIGGLE

I couldn't resist showing you this delightful little program. Everyone who sees it falls in love with it. Galactic Giggle isn't just a game. It is a work of art which can steal your time just as quickly as the best game. I would hate to admit how many hours I've watched and listened to it, or simply let it play on the family TV while doing other things.

If you own an Atari computer and have guests or neighbors drop in, run this program. There are few better ways to show off the amazing color and sound capabilities or the sheer fun of your new toy than with Galactic Giggle.

AN ASIDE ON PROGRAMMING TECHNIQUE

Look at the program listing. In coding the program I violated at least five programming rules. I had two reasons for this. First, you should be aware of good programming rules and, where possible, you should follow them. To do so will make it easier for you to write good programs. Second, the Atari computer lets the programmer break some of the rules to save memory. This can mean the difference between a program that runs and a program that won't fit in the machine.

The first two rules that bit the dust in this program are: use lots of *meaningful* comments and put only one statement on each line. Eliminating comments and putting a lot of statements in the same line saves huge amounts of memory and increases the speed of the program. It can also make the program nearly impossible to understand. Fortunately for you, I will tell you how Galactic Giggle works.

Many computers let you mix algebraic operators (such as + and −) with comparison operators (such as < and >). It's good practice not to do it, however. Some computers let you use expressions in a GOTO or GOSUB. Doing this is a *terrible* idea. Besides making the program nearly unreadable, think about the problems of renumbering the program! Unfortunately, breaking both of these rules is a good way to save memory and increase speed.

Here are two examples showing both the correct way and then the incorrect (but speedy and memory efficient) way to program.

```
Correct:    A=3
            IF G=7 THEN A=5
            IF G<5 THEN A=9
Efficient:  A=3+2*(G=7)+6*(G<5)
Correct:    IF A=17 THEN 200
            IF A<7 THEN 1000
            IF A>27 THEN 300
            GOTO 100
Efficient:  GOTO 100+100*(A=17)+900*(A<7)
            +200*(A>27)
```

If a comparison is true on the Atari computer, it is assigned the value of 1. It is assigned 0 if it is false. If G equals 7 in the first example, then A=3+2*1+6*0 or A=5. Likewise, if A<7 in the second example, then we have GOTO 100+100*0+900*1+200*0 or GOTO 100+900 which is GOTO 1000.

We now have one last rule to break. It is bad programming practice to leave a FOR-NEXT loop. Always try to complete them. With some computers, failure to do so can lead to strange and hard to trace errors.

Here is the correct and the incorrect way of leaving a FOR-NEXT loop.

```
Correct:   20 J=3
           30 FOR I=0 TO 10
           40 J=J—A(I)
           50 IF J < 0 THEN I=10:NEXTI:GOTO20
           60 PRINT B(J)
           70 NEXT I

Efficient: 20 J=3
           30 FOR I=0 TO 10
           40 J=J—A(I)
           50 IF J < 0 THEN 20
           60 PRINT B(J)
           70 NEXT I
```

I put several statements on the same line to make it obvious. On at least one occasion, removing the two extra statements on line 50 has permitted a program to finally fit in memory.

BACK TO GALACTIC GIGGLE

The program runs in graphics mode 23. This is high resolution graphics with no text window at the bottom of the screen. I will begin my description at the center of the program and work out. X and Y are distances from the middle of the TV screen. Lines 90 through 120 place four lights on the screen in a symmetrical pattern using color register C. Line 130 picks out any one of 256 possible colors and brightnesses and assigns it to the lights and line 140 turns off one of the other color registers. Changing colors in this fashion gives the impression of rapid motion on the TV.

The sounds, or "giggles," are created on lines 150 and 160. Since two separate sound registers are used, two sounds are always heard: Sound register *1* is a frequency based on *X*, using a clear tone (*10*) that is loud (*15*). Sound register *2* is a frequency based on *Y*, using a resonant buzz (*12*) that is loud (*15*).

Lines 40 through 80 and 170 through 180 determine the actual effect produced by Galactic Giggle. Lines 40 and 50 say that we will pick out each of the three color registers 30 times. Lines 170 and 180 tell us that if we ever finish this task, then we will go back up and declare the graphics mode again. This clears the screen and we start all over.

Lines 60 and 70 pick out how far the next set of four points will be from the previous set. Line 80 is the key to the entire program. As X and Y keep changing, it is possible for them to run off the screen or become negative. As long as they aren't negative, (X>=0)=1 and (Y>=0)=1, and as long as they are on the screen, (X<80)=1, and (Y<48)=1, then the program will GOTO 20+70*1*1*1*1 or line 90.

If any of these conditions fail, we go to line 20, reset X and Y to the center of the screen, and reenter the two FOR-NEXT loops. This does not clear the screen. Sometimes a galaxy will grow for an hour before disappearing, sometimes a galaxy will disappear in seconds.

Memory location 77 is the screen saver timer. Every four seconds 1 is added to the location. When it reaches a value of 128 then the screen starts changing colors. This is done to prevent burning an image onto the TV screen. By constantly resetting location 77 to 0 in line 30, the screen saver is kept from ruining the colors of the galaxy.

This program was originally designed by Dick Ainsworth of The Image Producers, Inc. for the "Sears Personal Computer Programming Guide." Once you've seen it you'll probably agree that this program does a nice job of showing off the Atari computer.□

Al Baker can be contacted at The Game Corner, P.O. Box 1234, Cerritos, CA 90701.

PROGRAM LISTING

```
10 GRAPHICS 23
20 X=0:Y=0
30 POKE 77,0
40 FOR A=1 TO 30:FOR C=1 TO 3
50 COLOR C
60 X=X+INT(RND(1)*15)-7
70 Y=Y+INT(RND(1)*15)-7
80 GOTO 20+70*(X)=0)*(X(80)*(Y)=0)*(Y(48
)
90 PLOT 80+X,48+Y
100 PLOT 80+X,48-Y
110 PLOT 80-X,48+Y
120 PLOT 80-X,48-Y
130 SETCOLOR C-1,0,RND(1)*256
140 SETCOLOR 1+(C=1)-(C=2),0,0
150 SOUND 1,X,10,15
160 SOUND 2,Y,12,15
170 NEXT C:NEXT A
180 GOTO 10
```

THE MICRO-MATHEMATICIAN

By Dr. Alfred Adler

FOURIER ANALYSIS

We noted the program Fuzzy Decision Making, by C.P. Whaley in the November 1979 issue. Several other computerists agree that this type of program is one of the first major steps forward toward using the computer for what the computer should be used for, rather than as simply a high speed automatic calculator. Even the lowly microcomputer has the potential to be a tightly coupled extension of the human mind, not just an ancillary number grinder. We converted the program to North Star BASIC, but had some considerable trouble with the string manipulation.

The problem is that the program as published used L$(I) and C$(I) in the same way that most BASICs use X(I) and Y(I). Unfortunately, North Star BASIC and many other BASICs do not permit that. In these BASICs L$(I) means that part of L$ starting at the Ith character and proceeding to the end. There are many ways to solve this problem, most of them requiring extensive alterations and ending up with a much longer program. After not too much thought it appeared that the simplest way to go was to set up a function definition that would permit North Star BASIC to use L$(I) and C$(I) in the same way that they were used in the original program. Except for personalization, the following changes were made.

Line 145 - L$(10) changed to F$(256) and G$(256)
Line 147 - DEF FNL$(K)=F$(16*K-15,16*K)
Line 148 - DEF FNC$(K)=G$(16*K-15,16*K)
Line 1120 - FORI=1TO16*NSSTEP16\INPUTF$(I,I+15)\NEXT
Line 1142 - FORI=1TOM\A(I,I)=1.0\NEXT
Line 1150 - FORI=1TO16*MSTEP16\INPUTG$(I,I+15)\NEXT
Line 1170 - Change C$ to FNC$ and change L$ to FNL$
Line 1420 - Change C$ to FNC$ in both places
Line 1435 - IFX=2THEN1438
Line 1436 - A(J,I)=Y\A(I,J)=1/Y
Line 1437 - GOTO1450
Line 1438 - A(I,J)=Y\A(J,I)=1/Y
Line 1610 - Change L$ to FNL$
Line 1650 - Change L$ to FNL$

FOURIER SERIES

Much of the world's most interesting phenomena involve fluctuations between reasonable narrow limits and with a sort of sloppy regularity. For example, the diurnal, or weekly, or yearly variation of temperature in a given place; or the price of a particular common stock, or of lettuce; or the deer population in a given area; etc., etc. These events wax and wane with what could loosely be called regularity, but they are certainly not periodic.

They can be classified as 'quasiperiodic,' however. Some of the ups and downs appear to be almost random; but are they truly random, or does the function simply involve more variables than man, in his infinite ignorance, can handle? How do we study these phenomena mathematically? The most obvious way seems to be to turn to the extensive mathematics already available for the study of periodic functions.

This, unfortunately, immediately raises a very nasty question. The mathematics of periodic functions can be divided into two related but different areas. The first deals with periodic functions with a fixed but finite period. This means that the phenomena repeat exactly, and we stress exactly, at a fixed interval, or period, which must be known.

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CIRCLE INQUIRY NO. 41

It is vital that the period be known, which makes dealing with a quasiperiodic function, whose period is seemingly random, very difficult. The tools used in this area are referred to as Fourier Series.

The second area of mathematics deals with periodic functions whose period is infinite. This means that over a finite interval the phenomena do not in general repeat at all, much less exactly. On the face of it, it would appear that this area is made to order for dealing with the type of situation we have. The tools used here are called Fourier Integrals.

As luck would have it, however, there is a small catch to the use of the Fourier Integral; and it may well be the death blow. The very fact that the period is infinite and therefore over a finite interval the phenomena do not repeat implies that in reality we are not dealing with a periodic function at all. In fact, this theory is most often used to deal with the effect of a single unrepeated pulse.

More to the point, we must specify the shape of the phenomena over the entire infinite range of the period. This we cannot do with such things as the temperature variations, stock price variations, and deer population figures previously mentioned since we have historic data only back a finite time, and no future data at all. And in those areas where we furnish no data, the theory assumes that the values are zero.

This is assuredly wrong. We know that the values could not have been zero at times before which we have data and we certainly do not expect the values to become zero in the next instant and remain so. The data points available for using the Fourier Integral, therefore, appear to be totally inadequate.

We therefore should be much better off using Fourier Series and either making the best estimate we can of the period, or trying several values and studying the results. The difference in the data from period to period will simply have to be accepted as part of the phenomena and will be averaged out. Since the results cannot be more accurate than the input, the degree of inconsistency in the data from period to period will serve as a measure of the accuracy of the results.

The theory of Fourier Series is quite involved and difficult. It is undoubtedly one of the richest and most interesting areas of mathematics, having tentacles connecting it tightly to many other areas. Fortunately for the engineering world, the application of the theory is not difficult at all, if the discussion is limited to the type of well behaved function usually encountered in the real world. We will therefore get no more involved in the theory than absolutely necessary.

It all started on December 21, 1807 when the mathematician and engineer Joseph Fourier announced to the French Academy that an arbitrary function, defined in a finite interval, can always be represented by a sum of pure sine and cosine functions. This theory transformed the world of mathematics.

Modern Fourier Analysis boils down to the fact that an arbitrary periodic function can be represented as closely as desired by an infinite series of harmonic sinusoidal components. This property enables us to relate the time domain and the frequency domain, which means that we can discuss a function of time in terms of its frequency components. Physical problems related to frequency response and waveforms, the response of a system to an arbitrary excitation, heat conduction and elasticity problems, etc. are all particularly suitable for solution by Fourier analysis.

Specifically, an arbitrary function of time, f(t), can be represented as follows:

$$f(t) = \frac{a_o}{2} + \sum_{n=1}^{n=00} [a_n \cos(2\pi nt/T) + b_n \sin(2\pi nt/T)]$$

where T is the period and n = 1,2,3,4,-----. $\frac{a_o}{2}$ is the average value of f(t) over one period which is the same as saying it is the DC component. The a_n and the b_n are coefficients which indicate how much of each particular harmonic is present.

Note that the arguments (the part in parentheses) of the sine and cosine terms are dimensionless, which they must be. Given the a's and b's it is possible to reconstruct or synthesize the original function. On the other hand, harmonic analysis consists of determining the values of the a's and the b's, given f(t). If we directly integrate both sides of the above equation over one period, we find that

$$a_o = \frac{1}{T} \int_0^T f(t)dt$$

If we multiply both sides of the original equation by cos(2 mt/T), do a bit of trigonometric manipulation and integrate over one period, most of the result equals zero and we are left with

$$a_n = \frac{2}{T}\int_0^T f(t)\cos(2\pi nt/T)dt$$

Similarly, if we multiply both sides of the original equation by sin(2 mt/T), manipulate trigonometrically, and integrate over one period, most of the result equals zero and we are left with

$$b_n = \frac{2}{T}\int_0^T f(t)\sin(2\pi nt/T)dt$$

These equations for a_n and b_n are referred to as the Euler formulas.

As mentioned before, given an arbitrary wave shape, or function, the Euler formulas may be used to determine the a_n and the b_n, usually referred to as the Fourier coefficients. This process is known as Fourier Analysis. These coefficients completely describe the frequency spectrum of the original function of time. That is, a plot of the coefficients, a_n and b_n, versus n gives a picture of all the frequencies present in f(t) and their relative amplitude. This is what was meant when it was stated that Fourier Analysis enables us to relate the time domain to the frequency domain.

Alternatively, given the Fourier coefficients we can use the originally stated equation to reconstruct or synthesize the original time function, f(t). The accuracy to which this can be accomplished depends on how many terms we have in the Fourier series; that is, how high n goes.

In the event that f(t) is a simple, truly periodic function, such as a sine, cosine, square, triangle, sawtooth, or similar shape or combination thereof, certain interesting symmetry conditions may prevail. For example, if f(t) is symmetric about the vertical axis (t=0), that is, if f(t) = f(-t), then f(t) is said to be an even function. In this case, all the terms of the Fourier series are sine terms and all the b_n equal zero. On the other hand, if f(t) is antisymmetric with respect to the original, that is, f(t) = -f(-t), then f(t) is said to be an odd function, all the terms of the Fourier series are cosine terms and all the a_n equal zero.

Another type of symmetry may influence the absence of the odd or even harmonic terms. For instance, if f(t+T/2) = f(t) then only the even harmonics will be present, and if f(t+T/2) = -f(t) then only the odd harmonics will exist. Attention to these simplifying symmetry properties will often save considerable computation, to say nothing of reducing the chance of error.

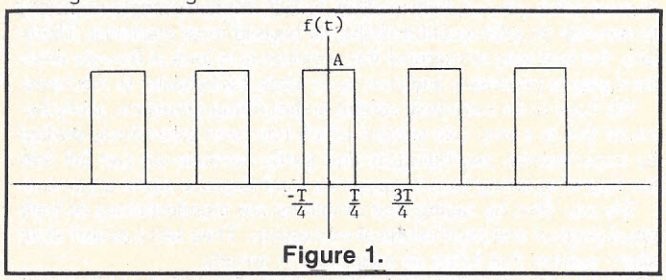


Figure 1.

If for example, f(t) = A sin(2πt/T), the first sine coefficient, b will equal A and all the other b_n and all the a_n will equal zero. If f(t) = A sin(8πt/T), then b_n will equal A and all the other coefficients will equal zero. Similarly, if f(t) is a pure cosine, one of the a_n will equal A and all the other coefficients will equal zero.

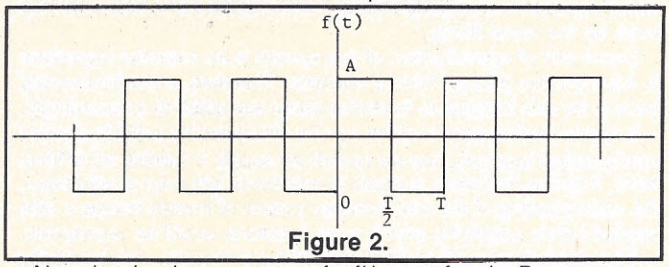


Figure 2.

Note that the above equations for f(t) are in fact the Fourier series. Suppose f(t) is a square wave of amplitude A as shown in Figure 1. Since the average value of the function is A/2, a_o will equal A. Since f(t) is an even function, all the b_n equal zero. Using the Euler formula for the a_n, we obtain

$a_n = 0$ if n = 2,4,6,....
$a_n = 2A/n$ if n = 1,5,9,....
$a_n = -2A/n$ if n = 3,7,11,....

If we delay f(t) by one-quarter period and remove the DC term the function is as shown in Figure 2. This is an odd function and therefore all the a_n are equal to zero. Using the Euler formula for b_n we obtain

$b_n = 0$ if n = 2,4,6,....
$b_n = 2A/n$ if n = 1,3,5,....

The triangular wave shown in Figure 3 is also an odd function. Again the a_n all equal zero. From the Euler formula for b_n we obtain

$b_n = 0$ if n = 2,4,6,...
$b_n = 8A/n$ if n = 1,5,9,....
$b_n = -8A/n$ if n = 3,7,11,....

Note that in all of these examples f(t) has a phase angle of either 0 or 90 degrees with respect to t = 0. It is for this reason that the Fourier expansions contain only sine or cosine terms. If the phase angle were not an even multiple of 90 degrees, both sine and cosine terms would be present.

A parallel shift of the horizontal axis changes only the a_o term, whereas a parallel shift in the vertical axis disturbs the phase relationships and therefore the sine and cosine structure of the series, but not the odd-even harmonic content of the wave.

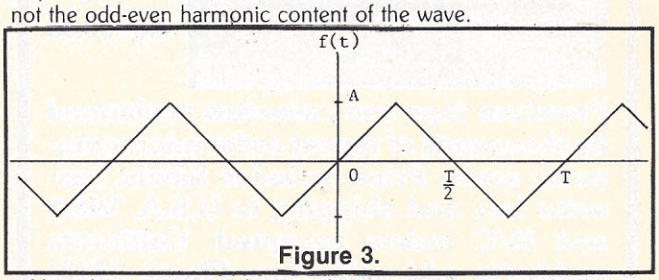
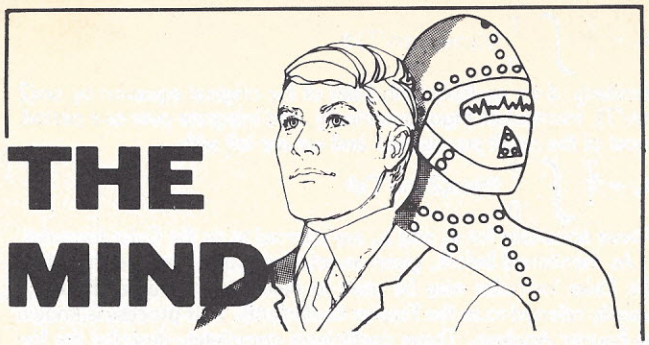


Figure 3.

Now that certain simple wave forms have been examined using Fourier theory, the next step is to attempt to analyze quasiperiodic functions. In order to do this we really need the assistance of a computer and Program 4YESERES has been written with this in mind.

As a training aid, it contains a built-in sinusoid, a square, and a triangle. These can be phase shifted, the assumed period can be adjusted, the time increment at which the wave is sampled is adjustable, and the number of terms in the Fourier series can be chosen at will. If we choose not to use these built-in functions, but instead use functions we desire to analyze, the program becomes a full-fledged Fourier Analysis and function synthesis tool. □

Contact Dr. Adler at P.O. Box 1234, Cerritos, CA 90701



THE MIND REVOLUTION

By Merl Miller

Is a machine capable of creative thought? It may seem unrealistic to ask this question before we determine whether or not a machine can think at all, but isn't all human thought to some extent creative? This month, let's discuss a specific aspect of creative thought. Can a machine "create" a serious work of art?

It is important here to keep in mind what we mean by creativity. To program the computer to merely produce what is implicit in the programmer's instructions is not being creative. If, however, the computer produces the "painting" spontaneously, it may be a creative act.

To understand this situation we must look at the computer and ask what is missing when it is compared to a human being. We will assume that the computer is programmed with a highly flexible heuristic program. The ability to reason, think and solve problems can be built into this program but some of the *intelligent features* necessary for creative thought are still missing, mainly emotions.

We can represent emotions by some mathematical means in a system; for instance, as a restraint to some cognitive activities. This might work in some instances, but we will run into some real problems when applying this idea to artists. The emotional ups and downs of most artists are not mathematical. In fact, the randomness necessary to simulate an artist would probably be beyond most machines. Therefore, the best way to examine this problem is to look at the role emotions play in organisms and then try to relate this behavior to machines.

We have to be extremely careful in describing emotions, partly because this is a very vast subject which has been extensively studied by experimental psychologists and partly because we can fall into the trap of ignoring facts because we want to prove some argument.

We can start by saying that emotions are manifestations of both physiological and psychological expression. They serve as sort of an alarm system that helps us adapt to our society.

The exact method by which emotions are integrated into these behavioral patterns is not known. There are two common theories. The first states that bodily changes in the organism produce emotions; the other that emotions produce bodily changes. The actual situation is probably somewhere in between. It seems reasonable that emotional experience and body changes occur at the same time and may even be the same thing.

Some sort of reproduction of this system is an essential ingredient to have creative thought from a machine. Therefore, a machine would have to be able to relate to its environment and adapt to it accordingly.

It seems that emotional states can be simulated by suitably chosen mathematical functions, but we cannot yet supply a suitable set of functions. It seems that more analysis of emotional behavior is necessary. An understanding of the total behavior pattern of human beings is also needed before specifying exactly what functions would be appropriate.

The alternative to all of this is to build a computer which actually has emotions. We have the very primitive beginnings for such a system in the ordinary fuse box arrangement in a computer. There is no reason why we could not reproduce a more complicated fuse box system. This is a far fetched example, but to take it one step further — what if the fuse were made of some artificially created biological material? In fact, what would happen if the computer itself were made of a living biological material? Could it then learn to think, react and imitate Rembrandt? We are made of biological materials that come together by chance. What would happen if we created a thinking material on purpose? What do you think?□

Contact Merl Miller at P.O. Box 1234, Cerritos, CA 90701.

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By Roger Garrett
Contributing Editor

SONIC TRANSDUCER IDEAS

There is an interesting little device which has recently become available in a DIP (Dual In-Line Package). It is a *sonic transducer.* Probably the most well-known application of this device is in the new Polaroid Sonic cameras. Polaroid's transducer is used to determine the distance between the camera and the subject which is then used to set the focus of the camera.

The transducer works like this: a counter register is set to zero, a high frequency beep (sonic pulse) is sent out, the counter register begins counting; when the transducer detects the return of the beep (assuming it has bounced off of some object and returned to the transducer) the incrementing of the counter is stopped. The value which is left in the counter represents the distance between the transducer and the object which reflected the beep. This is because the speed of sound is relatively constant in air (or any other homogenous medium) and the incrementing of the counter is maintained at a constant frequency.

By knowing the speed of sound in the medium and the speed with which the counter is incremented, the distance can easily be determined. The accuracy of the measurement depends simply on the number of bits of accuracy in the counter and the speed with which the counter is incremented.

Such a device has many interesting applications and I will describe here several which I have come up with for use by computers.

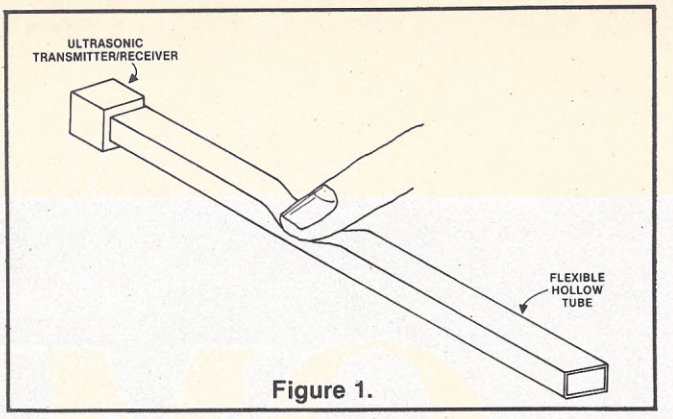


Figure 1.

FIGURE ONE

Suppose we connect one of these sonic transducers to the end of a flexible hollow tube. If we constrict the tube at some arbitrary position then the transducer can detect the position of that constriction.

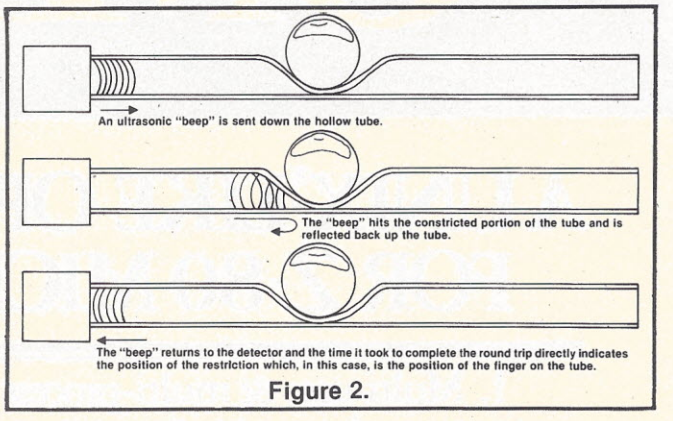


Figure 2.

FIGURE TWO

Looking at a cutaway side view of our hollow tube we can see what happens. In the top view the counter has been set to zero and the pulse has been generated. It can be seen emerging from the transducer on the left.

In the middle view, that pulse has hit the constricted portion of the tube and has been bounced back to the left. In the bottom view the pulse has struck the transducer, which then stops the counter from incrementing.

The value of that counter now corresponds directly to the position of the constriction (i.e. the position of the finger) on the tube. But what could we use such a device for?

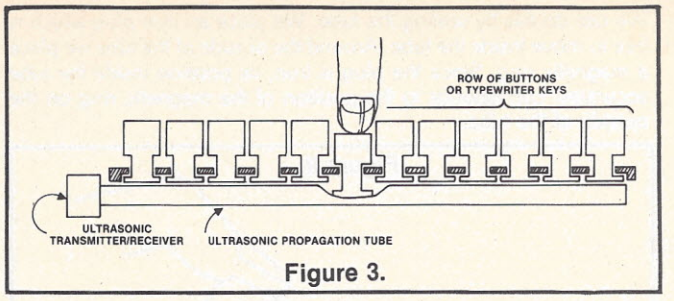


Figure 3.

FIGURE THREE

Suppose we have a large set of pushbuttons and we want to reduce the cost of wiring each one separately and providing appropriate addressing circuits. We could position the pushbuttons as shown here above our flexible-tube transducer. The flexibility of the tube keeps each of the buttons in the up position so no special springs are needed on individual buttons.

Periodically (about every ten milliseconds or so) we activate the transducer to determine whether any button is currently pressed. If there is no button press, the transducer will not detect a return of the sonic beep. This could easily by detected by the overflow of the counter register. If, however, a button is pressed, the pulse will return to the transducer and the counter value will indicate which button was currently pressed.

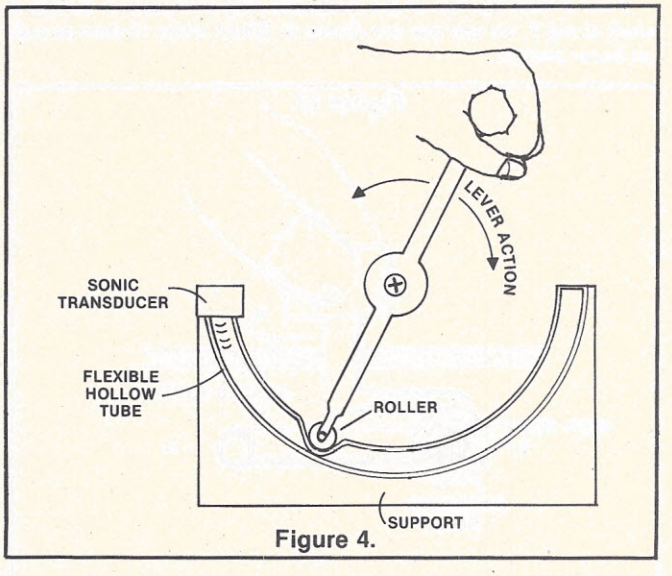


Figure 4.

FIGURE FOUR

If we position the transducer-tube as shown here we can detect the angular position of the lever. Such a device would be an improvement over existing analog-to-digital converters because there are no electrical contacts to wear out or get dirty, causing invalid readings.

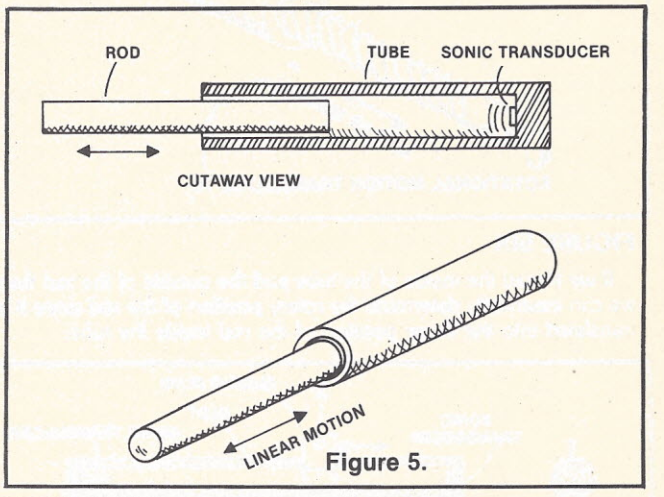


Figure 5.

FIGURE FIVE

To detect simple linear movement we could construct a device which resembles an hydraulic cylinder. The transducer is positioned at the far right inside the hollow tube. Fitted inside the tube is a solid rod which is free to move linearly. The sonic beep is bounced off the inside flat end of the rod, thereby giving a measurement of the extension of the rod. Such a device could be used in robotic devices to provide the feedback of arm or finger positions.

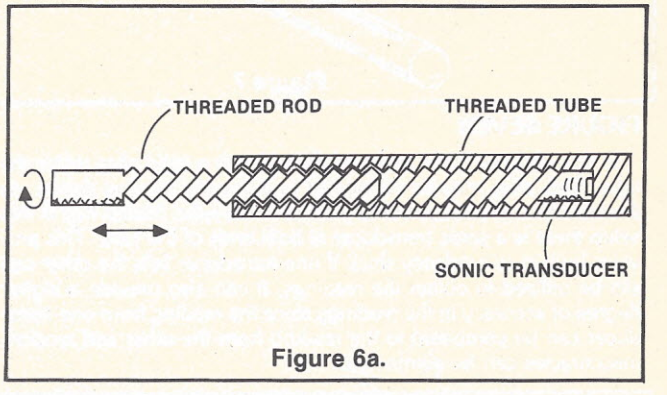


Figure 6a.

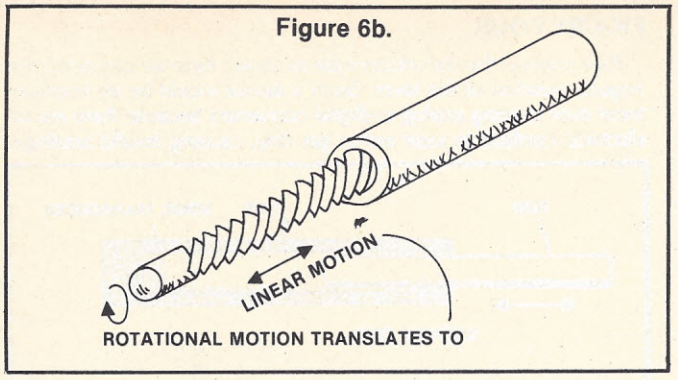


FIGURE SIX

If we thread the inside of the tube and the outside of the rod then we can essentially determine the rotary position of the rod since it is translated into the linear position of the rod inside the tube.

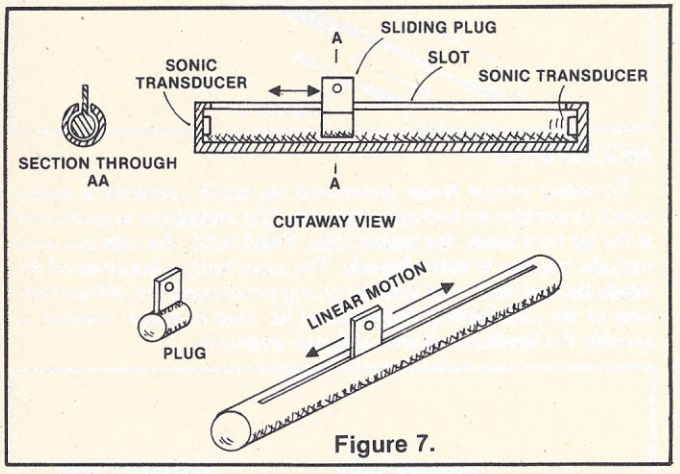


FIGURE SEVEN

In this setup we have replaced the rod with a solid plug inside the tube. This plug may be connected to a linearly moving device via the tab which protrudes out of the slot in the tube. Notice that in this setup there is a sonic transducer at both ends of the tube. This provides built-in redundancy since if one transducer fails the other can still be utilized to obtain the readings. It can also provide a higher degree of accuracy in the readings since the reading from one transducer can be compared to the reading from the other and random inaccuracies can be eliminated.

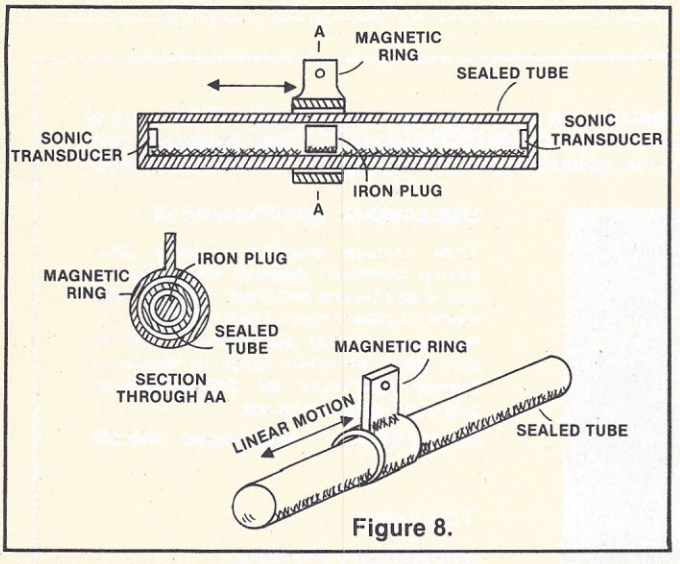


FIGURE EIGHT

If we want to use our measuring device in hostile environments (i.e. dirty), we will have to protect the transducer and ensure that no extraneous material gets into the tube to cause spurious readings. We can do this by sealing the tube. We place an iron plug which is free to move inside the tube. Around the outside of the tube we place a magnetic ring. Since the plug is iron, its position inside the tube accurately corresponds to the position of the magnetic ring on the outside of the tube.

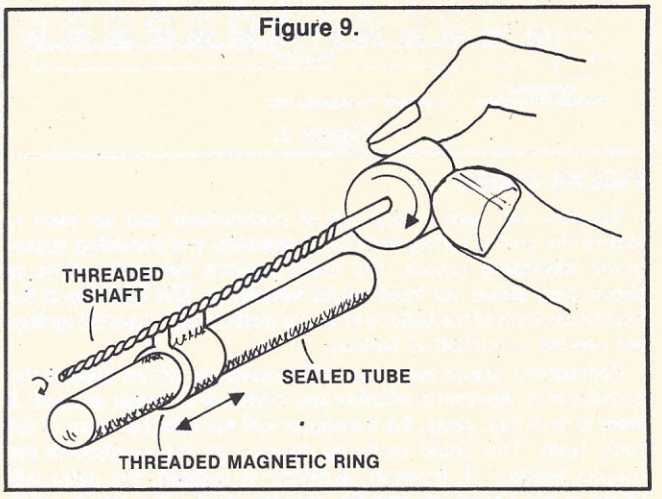


FIGURE NINE

If we thread the top of the magnetic ring and place a threaded shaft along it, we can use our device to detect rotary motion as well as linear motion.

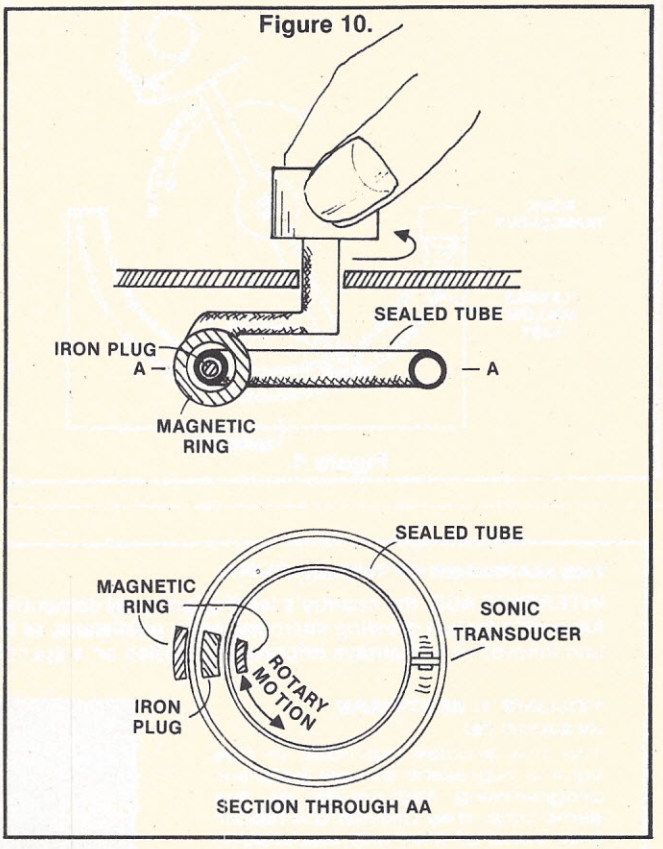


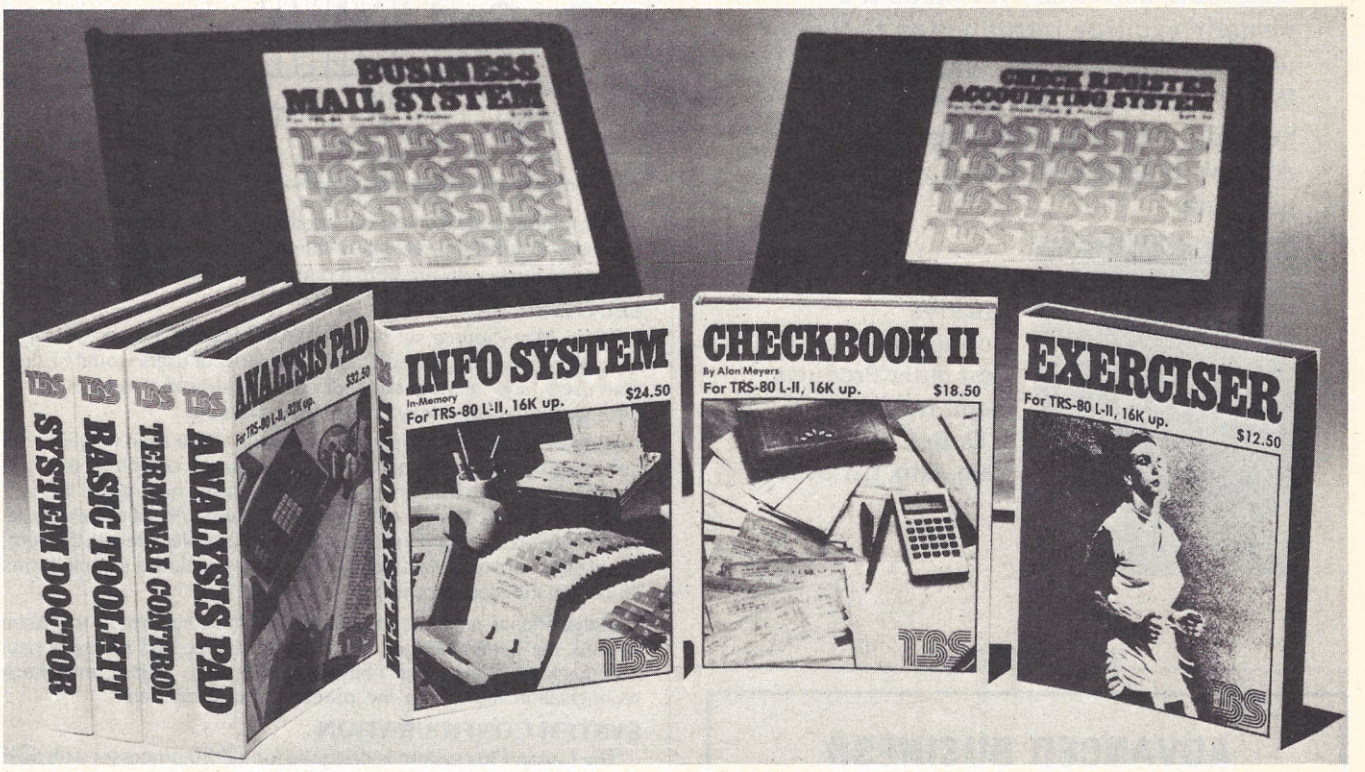
FIGURE TEN

And finally we can form the tube itself into a torous so that the magnetic ring moves the iron plug around the inside of the circular tube.

Are these ideas practical? The last time I wrote about ideas to replace analog-to-digital converters I received quite a variety of opinions. One fellow wrote that I was proving that there are many ideas whose time will never come, indicating that my suggested ideas were not practical since better methods already existed.

Yet, in response to the same article, I received inquiries from several manufacturers interested in producing the devices. Who was right? I don't know. Are this month's ideas worthwhile? You may write to me at Inventor's Sketchpad, P.O. Box 1234, Cerritos, CA 90701.□

THE BEST.



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BUSINESS SOFTWARE REVIEW

By Carl Heintz

This month's review features another outstanding general ledger package. In addition, we will re-introduce the popular rating chart used to evaluate software from a number of user-critical standpoints.

LEDGERPLUS

When MicroSource set out to market software for microcomputers, they apparently decided that the majority of users would be first-time users, and that any software package should stand alone as a fully documented, easily understood package.

LedgerPlus is the only piece of software I have seen in which the operating system and applications programs are combined into one neat package. And its manual not only describes how to use the software, but comments on how to use the hardware. And it contains a description of accounting principles and how these integrate into the computerization process. And finally, the manual includes sample forms (to control the input process).

LedgerPlus is only one module of the whole system. At this point in time, the general ledger, accounts receivable and accounts payable packages have been marketed. Inventory, payroll and check reconciliation are still in the process of development.

SYSTEM CONFIGURATION

The LedgerPlus system is designed for a Z-80 processor with 48K at least, two RS-232 ports. A dual minifloppy system must be present. In the documentation which I reviewed, a Vector MZ was specified. Since the system comes with a completely configured operating system, the purchaser must specify what computer he is using.

The system is designed to operate with a Soroc or Hazeltine terminal, and a TI-810 or a DEC printer. That's it. Since the operating system is not accessible to the normal user there is, for the average user, no way to adapt the programs to run on anything else. (For example, I was unable to use my Qume printer with LedgerPlus because the Qume uses a "diablo" type of protocol to "speak" to the RS-232 port. However, I had no trouble using my Integral Data printer, since it uses "teletype" protocol. One word of caution, however — you need a printer capable of 132 spaces across for some of the runs.)

CAPACITY

The following chart will give an idea of the capacity of the system:

With this many ACCOUNTS in the Chart of Accounts	and this many HEADERS in the Financial Statement Headers	then about this many TRANSACTIONS may be saved before purging is necessary
100	120	3720
100	150	3600
200	150	3200
200	220	2920
300	160	2760
300	240	2440

Note that the total number of accounts may be from 1 to more than 600.

This type of chart is immensely valuable information for the potential purchaser, for it gives an idea of how much detail the system can retain from period to period. Many potential users of computerized general ledgers are turned off because in many systems, at the end of each monthly posting cycle, all of the detail is purged. Ideally, users would desire to retain this detail for a longer period of time, perhaps the entire year. This can be a reality on the LederPlus system.

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APPLE II without ROM APPLESOFT	48K	3500	$74.95
MICROPOLIS (MOD I & II)	32K	9999	$150.00
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DEALER INQUIRIES INVITED

The average small business has about 150 to 200 accounts, maximum. Let's assume 300 for conservatism. From the chart, it is apparent that as many as 2760 transactions can be retained. How would this accommodate a business' transactions? Here's a hypothetical example:

Transaction type	# Accounts affected	# entries each year	# of transactions total for the year
Sales	4	12	48
Payroll	4	24	96
Cash Receipts	3	12	36
Checks (cash disbursed)	50	12	600
Misc. journal entries	2	50	200
TOTAL TRANSACTIONS FOR THE YEAR			980

In the example above, we assumed that sales was entered once a month, in summary totals (12 entries, which affected four accounts). Payroll was entered twice a month, and we assumed that only the summary totals were entered. Cash receipts were entered once a month, and affected three accounts (Cash, Accounts Receivable, and Misc.).

The most critical determinant was the number of checks written. In the example we assumed that about 50 checks were written each month. Each check was distributed to its respective account, and only the total of all the checks was subtracted from cash as total cash disbursed. And we have a provision for 50 or so miscellaneous journal entries (recording depreciation, etc.) which might occur during the year.

These figures represent pretty much a minimal situation for a small business. As you can see, we end up with less than 1,000 transactions which leads to the conclusion that LedgerPlus would easily handle all of the company's detail, and be able to retain an entire year's worth for review or audit.

RUNNING THE SYSTEM

As a sign-on, the system displays the following:

```
*****     MicroSOURCE LedgerPlus     *****
*****                                *****
*****          ACCOUNTING MENU       *****
WHICH SYSTEM WOULD YOU LIKE TO ACTIVATE:
     1. GENERAL LEDGER
     2. ACCOUNTS RECEIVABLE
     3. ACCOUNTS PAYABLE
     4. CHECK RECONCILIATION
     5. PAYROLL
     6. INVENTORY
     7. MAILING LIST
ENTER THE NUMBER OF THE SYSTEM TO ACTIVATE >
```

Selecting any system other than the general ledger system will result in a prompt requesting the operator to insert the correct system diskette. If GL is selected, then the following menu appears:

```
*****     MicroSOURCE LedgerPlus     *****
*****                                *****
*****      GENERAL LEDGER SYSTEM     *****
*****             MENU               *****
WHICH TASK WOULD YOU LIKE TO PERFORM:
     1. UPDATE AND VIEW ACCOUNTS
     2. POSTING JOURNAL
     3. TRIAL BALANCE
     4. PRINT CHART OF ACCOUNTS
     5. HISTORY LISTING
     6. EDIT STATEMENT HEADERS
     7. PRINT FINANCIAL STATEMENTS
     8. COPY AND PURGE FILES
     9. CREATE A DATA FILES DISKETTE
    99. END GENERAL LEDGER PROCESSING
ENTER THE NUMBER OF THE TASK TO PERFORM >
```

The entire system responds with menu after menu, so that an operator can almost run the system without looking at the manual (dangerous, but possible).

FILES

The heart of any accounting system is the file structure used to organize the system. In the LedgerPlus system, there are four basic data files which are used to record information about a company. All data files are kept on a diskette separate from the programs, so that this set of programs can be used for many clients.

The first file is the ID label file, which contains company name, the last posting date (this date is presented to the user at strategic places in the program to remind him/her of the status of the data and to prevent errors).

The next one is pretty much a necessity also — the chart of accounts record file. The contents of this file, and the way it functions, however, have dramatic impact upon the entire architecture of the general ledger system. In many general ledger systems, the account number is a critical factor in determining how the account will appear on the financial statements, and where it will appear. In the LedgerPlus system, a six-digit number can be used, and this number is used only to identify accounts and facilitate posting of transactions. *The account number does not affect the appearance of accounts nor their positioning on the financial statements.* This may not seem like a significant feature, but its magnitude can only be appreciated when one has to use it.

Account titles can have up to 30 characters, but for financial statement purposes the critical determinant is the "header." Headers are like little buckets into which the balances of accounts are combined for financial statement presentation. There can be up to 120 headers, each with a position number. There are some constraints upon position numbers, however:

Income Statement

1- 20 Reserved for Operating income (sales, etc.)
21- 60 Reserved for Other income (interest, etc.)
61-120 Reserved for Expense, or cost accounts

Balance Sheet

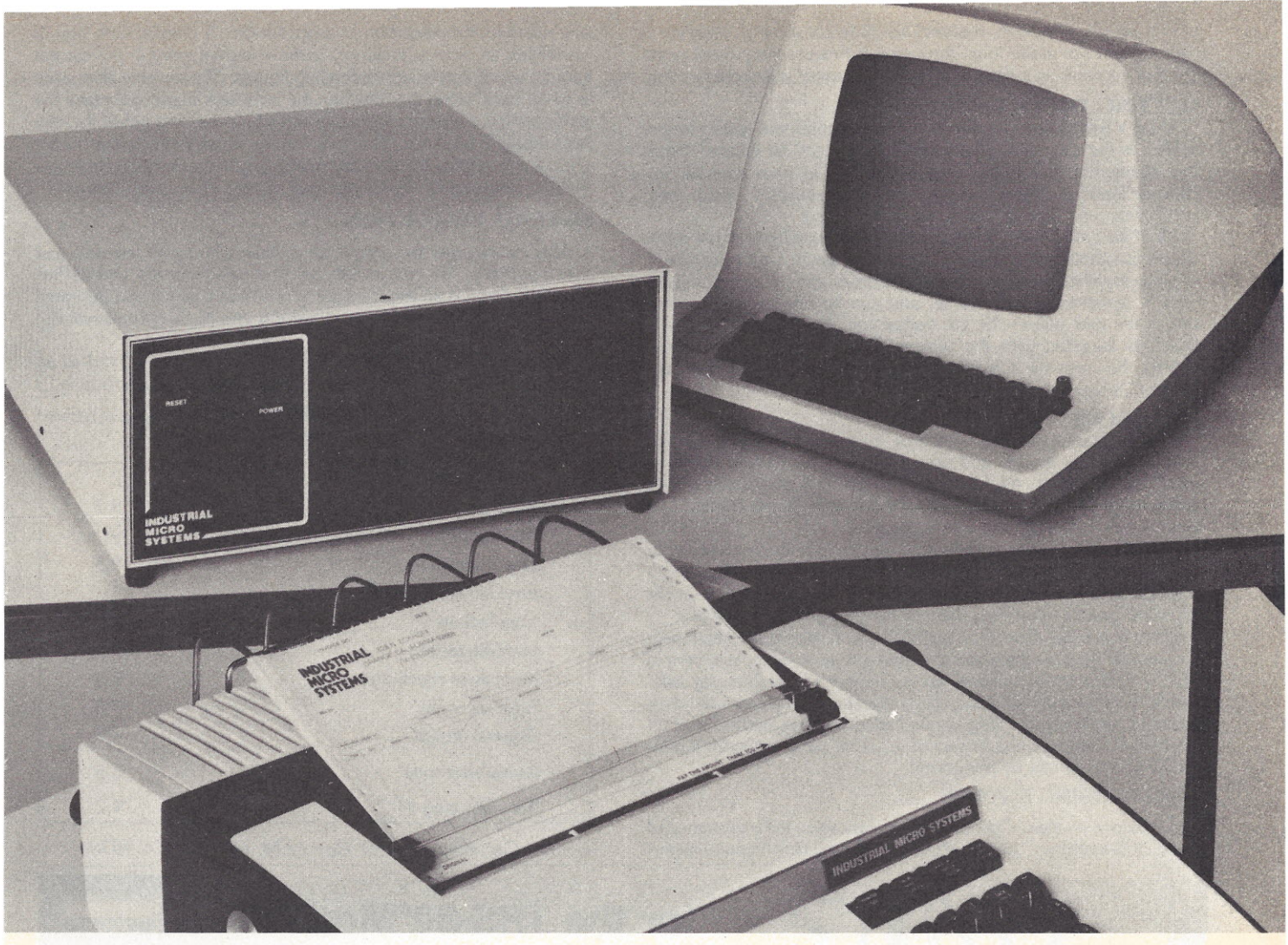
1- 60 Reserved for Asset accounts
61-120 Reserved for Liability and equity accounts

What this means in actual practice is that the financial statements have a limited number of headings, which is generally the case due to the paper constraints (60 lines on an 11" piece of paper).

Setting up the header files was not difficult at all. Again, menu format guides the user rapidly through the process.

The "Header File" also allows a number of fancy and useful functions: (all entered by specifying a control code)

1. Skipping lines
2. Subtotaling
3. Underlining
4. Report date centered and printed



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The set up of headers is somewhat time-consuming, however. I found that it was easier to go through this process than to utilize the chart of accounts as a determinant of the financial statement position.

GETTING THE DATA IN

From a production standpoint, the most important aspect to any system is the ease with which monthly data can be entered. From this standpoint, the LedgerPlus system could be somewhat improved. Basically, there are three entry sequences — debit only, credit only, and debit/credit (a two-sided entry).

All of the credits must be entered and separated from all the debits unless the debit/credit option is elected, in which case a debit entry must be matched with a corresponding credit entry of equal amount. This is somewhat cumbersome, and can be effectively overcome only if the user utilizes the GL transaction sheet, a master copy of which is included with the system. The entry sequence, which utilizes the form as a guide in conjunction with the menu and prompt, is rapid and effective.

A PROBLEM

Ask an accountant what should be a control in every computerized accounting system and you will invariably have a response which includes the control to insure that the total of all debits posted to the ledger must at all times equal the total of all the credits. This insures that the ledger remains in balance.

Alas, the LedgerPlus system does not include these controls. In defense of the system, however, it should be pointed out that a manual accounting system has no controls to assure that the debits equal the credits other than the common sense of the operator.

There is another aspect to "control" which should be mentioned. It is entirely possible through the header set up to derive a system in which some account balances do not appear on the financial statements. Such a situation, in the hands of an employee prone to fraud, could be very costly. As long as other adequate safeguards remain in the system, however, the impact of accounts which might not print on the financials can be minimized.

POST CLOSING ENTRIES

In previous reviews of general ledger packages, the importance of "post closing entries" has been stressed. A post closing entry generally refers to the correction of a prior month's entries. One way of correcting an error is to simply make a journal entry in the current month, which can reflect misleading figures. The sensible alternative is to go back to the month when the error was made and make the entry so that it appears in that month's balance, and not in the current month's business. That is a feature which is important to the user of any general ledger system. Many systems do not include this feature. Fortunately, the LedgerPlus system allows such entries.

OVERALL EVALUATION

After having run the system for a while with some test data and live (real) data, the conclusion that one gets from the LedgerPlus system is that it is an excellent piece of software which was designed well, executed in code in good fashion and packaged attractively, with the requisite backup.

As a stand-alone system, it is more than satisfactory, and as an integrated system with its companion packages, it is outstanding.□

The little chart which has been used in previous reviews is revived and presented below with the LedgerPlus scores:

System interchangeability	2
Program interfacing	9.5
Maintainability	9
Documentation	9.5
Ease of installation	10
User lock-in	7
User interaction	9.5
Input error checking	9.5
Error recovery	9.5
General design	9.5
Cumulative total	8.5
Total ignoring #1	9.2

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Computers Become A Force at Consumer Electronics Show

By Terry Costlow, Editor

Even though many microcomputer manufacturers won't be displaying their systems at the Consumer Electronics Show in Las Vegas, there's a good chance that there will be as many microprocessor chips in the building as there would be at any large computer show.

When more than 750 makers of electronic devices meet for their semi-annual trade show January 5-8, they will be announcing several new microprocessor-controlled products. And one of the key concerns for both manufacturers and retailers will be the success of the many computerized toys offered during the Christmas season.

Although the home computer system seen by many as coming during the last decade still appears to be some time away, most American families are finding that computers have already entered their homes. Few households have invested in a personal computer system, yet millions have discovered the entertaining qualities of microprocessor chips in computerized toys, time-saving convenience items like push-button channel changing or programmable computerized microwave ovens.

For computer manufacturers who are interested in reaching the consumer market, CES is an excellent vehicle. Exhibitors get much exposure among the consumers they're trying to reach (53,000 people attended the 1979 winter show), and the session provides an easy way to meet with many retailers at the same time.

Since the retailers are already in the electronics business, they offer an outlet that far exceeds the influence of the average computer store. During the 1979 show, some manufacturers, including Apple, discussed the possibility of having stereo retailers carry their home computer systems.

Although this type of marketing has not yet begun in full scale, many manufacturers are hoping that a successful Christmas season for computerized toys and appliances will pave the way for widespread marketing of personal computer systems.

The winter CES has become nearly as important as its summer counterpart since it was begun in the winter of 1975. At that time, the show was primarily designed to allow retailers a chance to replenish their inventories for the Christmas season. It has since then become a popular time to announce new products, despite the fact that the largest consumer buying period ends just before the show opens.

Two large manufacturers, Mattel Electronics and Atari, chose to announce their home computer systems during the winter show in 1979, introducing Intellivision and the 400 and 800 Series, respectively. Many other computer companies, including Apple, Exidy and IMS, made their entry into exhibiting in general interest electronics shows at that session.

Also present last year were the many successful computerized toys from the 1978 Christmas season, including Simon, Merlin, Speak and Spell and the talking robot, 2XL.

"The winter show in 1979 marked the time when the video game and the computer crossed over," says Ralph Jones, CES Director of Communications. Despite the rapid influx of computerized devices during the last few years, Jones is not surprised at the widespread use of microprocessor chips.

"In the electronics industry, we're accustomed to fast-moving technology. Microprocessors have led to new developments in many fields, from toys to televisions," he says.

If there were any doubters in the crowd, the appearance of these highly successful toys and the increasing number of computer system displays at CES must have convinced all those who attended that there is much money to be made in any aspect of computers.

ATARI ADDS PERIPHERALS

Atari, one of the most widely marketed consumer computers, is adding three new peripherals to its line. In addition, some new software packages will be premiered at CES. All three of the peripherals can be interfaced with either the Atari 400 or 800 system.

The 825 printer will give Atari owners the capability of producing hard copy. This lightweight (10 pounds) unit features an adjustable print head, printing 7x7 dot matrix characters. Printing unidirectionally at 100 characters per second, the machine can output 30 80-character lines per minute. The 825 also features 96 ASCII character keys.

Atari's model 830 modem adds telecommunications and timesharing to the unit. This stand alone, frequency shift modem can transmit or receive at rates up to 300 baud. It operates on half or full duplex, and features a test mode to assure that it is working correctly. The Atari modem is compatible with Bell modems, allowing the user to interface with a wide variety of machines.

The third new peripheral, the model 850 RS232 interface, provides the method for the user to interface these new peripherals to his system.

The most interesting new software package being revealed at the show is an assembly language module. With this, Atari users will be able to program in a more advanced language than the BASIC currently available.

Other new packages include a calculator program, music composer and personal finance. Along with these, Atari will be highlighting basketball, an educational master cartridge, a video easel art program and the popular Star Raiders.

TI'S NEW TRANSLATOR

Texas Instruments, which announced its home computer system, the 99/4 at the summer CES in Chicago in June, does not plan any major system announcements at the show, according to spokesman Jim Muller. Speech will be a major thrust for the Dallas corporation, which introduced the popular vocal Speak and Spell toy in 1978. New modules to extend the capabilities of the machine will be introduced at CES, according to Muller.

TI's new product at the show, the Texas Instruments Language Translator, also talks. The translator uses the same voice synthesis chips as the Speak and Spell, and utilizes 4-bit TMS 1000 chips for memory storage, which has a capacity of a half-million bits.

Four modules can be inserted into this machine, letting users translate into English, French, German or Spanish. With the German module, for example, a user can enter a word in any of the three other languages, and the translator will respond with the corresponding word in German.

The unit has a capacity of 1000 words with the display, although its speaking vocabulary is limited to about 500

words. The TI translator can also tie words together and speak a short phrase, or, with a minimum of keying in, it can be programmed to repeat such "survival phrases" as "I need a doctor."

TI doesn't have any other major announcements scheduled, although spokesmen do not rule out any late moves by the company. The decision to announce the 99/4 last summer was made just days before the opening of the show.

NIXDORF'S TRANSLATOR

Another company offering a new translator is Nixdorf Corporation. The advanced language modules being introduced at the winter CES increase the capacity of earlier Nixdorf models by 250%, according to company representatives. Current translators have a capacity of about 2500 words.

Nixdorf is also announcing some new firmware packages for business applications for their LK 3000 machine.

One of the programs extends the capabilities of a single computer through the use of telecommunications. This package allows the user to connect the computer to a remote terminal via telephone lines.

Other new offerings by Nixdorf include a filing system, electronic notebook and an advanced calculator program.

COMMODORE SOFTWARE

Commodore will be announcing its newest software package, WordPro III, at the winter show. This word processing package is designed to run on the CBM 2001, and is compatible with Commodore, Diablo and Qume printers.

The program features global functions including search and replace, and formatting features such as line spacing, line justification and right or left alignment. Up to 170K bytes of character changes can be programmed to run without operator interruption.

Commodore has no hardware announcements planned at this time, although they hope to have some later in the year.

CHAFITZ' GAMES

Chafitz, a manufacturer of electronic games such as chess and the popular Boris Diplomat, will announce what might be one of the most expensive computerized single-game components in some time. The price tag on Aristotle, $2,500, make it more expensive than many of the home computer systems currently on the market.

This auto response backgammon game features a large 32-byte memory, with 12 bytes comprising the auto response mechanism. The auto response mechanism notes the new position after each move, eliminating tedious keying in of moves. The polished wood game board may play well enough to match its hefty price tag, however. After a recent backgammon tournament, world champion Luigi Villa was defeated by Aristotle.

Chafitz will also formally announce an auto response chess game and a portable modular game system at the show. These computerized Chafitz products were being sold in limited outlets during the Christmas rush, but will be formally introduced in Las Vegas.

OTHER ANNOUNCEMENTS

Apple Computers plans to introduce a new silent printer that is capable of handling graphics, but at press time they were uncertain whether the peripheral would be ready for announcement.

Apple will also be revealing some new software packages and some updates of older programs.

Panasonic and Toshiba are rumored to be announcing hand-held translators, making it probable that the market for translators will have reached the saturation point during 1980.

Many other companies will probably be introducing new offerings during the show, given the history of CES as an impressive starting point for consumer products.□

I made the TRS-80* into a serious computer. Now I've made the Model II into a spectacular one.

I'm Irwin Taranto, and I've helped almost a thousand businesses get their first computers up and running.

I've done it primarily with the TRS-80, because it's a really elegant piece of hardware. Given the right programs, it can do substantially the same work as the traditional minicomputers that cost four times as much.

I proved it with four on-line, interactive programs adapted from the genuine Osborne & Associates systems, originally designed for the $30,000 Wang computer. Then I added two of my own and made them all work on a $4000 TRS-80.

Now I've done the same thing for the new TRS-80 Model II. It's an $8000 computer that works twice as fast and has four times the memory—up to two million characters.

My new systems are fully documented, and because I'm working with a much more powerful computer, they're a night-and-day advance over the Model I programs. They'll turn your Model II into a complete business computer, set up and ready to go.

THE TRS-80 MODEL II PROGRAMS

General Ledger/Cash Journal: handles up to 7000 transactions on 500 different user-defined accounts. It keeps track of them by month, quarter and year, makes comparisons to the prior year, and does departmentalization.

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Accounts Receivable/Invoicing: keeps track of billed and unbilled invoices, open and closed items, aging and service charge calculation. It prints statements, links to the general ledger, and can work within either an invoice-linked or balance-forward accounting system.

Payroll/Job Costing: computes regular, overtime and piecework pay, keeps employee files, figures taxes and deductions, prints checks, journal, 941-A and W-2 forms, and breaks out individual job costs.

*A trademark of the Tandy Corporation.

When I say set up and ready to go, I mean just that. If you're not quite sure on that point, call the number below and we'll give you the names of some of the people who've already bought all over the world. Call them up and hear what they have to say.

These Model II programs are completely custom-tailored, which explains their $249.95 price. Before we'll send you a disk, you have to fill out a detailed questionnaire that tells us your precise business requirements. Then we send you the disk, all the instructions you need, and my phone number. If you call, we answer all your questions. If your questions are tough enough, I'll talk to you personally.

Because that way I'll make sure that Model II of yours turns into a spectacular computer, just like I promised.

☐ Please send me the custom questionnaires for the following $249.95 Model II programs:

- ☐ General Ledger/Cash Journal
- ☐ Accounts Payable/Purchase Order
- ☐ Accounts Receivable/Invoicing
- ☐ Payroll/Job Costing

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The Commodore PET:

Expanding from Home to Business

By Suzanne Rodriguez

Chuck Peddle, who is known as the father of the PET, does not strike one as being particularly fatherly. A handsome man with a craggy, world-weary face and a few days' accumulation of beard, he is listening with increasing impatience to the conversation in his office. Various marketing people are explaining to a visitor the reasons for Commodore's surprising and sudden desire for more media visibility. They seem to be skirting the issue: Commodore is making a push into the business market and needs to increase visibility.

"Look," Peddle says, leaning forward and slamming his hand softly on the desktop. Conversation in the room is immediately frozen. "We are the originators of the hobbyist computer and we are still the best damn hobbyist computer on the market. Unfortunately, people are unaware of this. They've begun to look at the PET as a low-priced item and not a quality item because we haven't paid much attention to advertising. We've been concentrating on turning out a good product instead. And, sad to say, it's advertising that makes a quality item in the mind of the public."

It was only a little more than two years ago that the introduction of Commodore's PET sent shock waves throughout the computer world. The hobbyist computer market — until that time the playground of a few engineering types who enjoyed assembling micros from kits — suddenly opened onto a limitless horizon.

The PET was feted in the media — cover stories and special issues abounded. Commodore's stock skyrocketed. Demand for the new machine so outstripped supply that delivery time on prepaid orders inched gradually upward from 30 days to four months. Keeping up with the unexpected demand became the most important goal at Commodore. Advertising seemed unessential for a product experiencing such vast demand.

The bubble never burst, exactly. It's just that quite soon other bubbles appeared on the scene: the TRS-80 and the Apple, and then the Atari, Texas Instruments and Mattel. Some of the latecomers offered features that Commodore did not have: color, a better keyboard, a larger screen.

The latecomers to the scene were greeted enthusiastically, but not with the chaos-causing madness which had overwhelmed Commodore. After all, the world already knew about hobbyist micros. Production flowed more smoothly for the latecomers because demand was easier to supply, more uniform. Late entry meant that advertising and media were essential. A proven market meant a ready supply of money to pay for advertising.

Commodore, which had never quite recovered from the staggering and sudden demand which followed PET's introduction, was busy trying to fill orders and get things running smoothly. Dealing with journalists and media became secondary to getting production on track, a feeling which was sometimes less-than-politely communicated.

So slowly that no one seemed to notice, interest in the PET lessened. Commodore eventually solved its internal production problems and continued to refine and produce its excellent machine. When Commodore recently expanded into the small business market, nobody was around to notice.

A flock of enthusiastic marketing people have been hired to upgrade Commodore's image and give the PET the attention it deserves. A new marketing vice president with years of expertise in computer marketing (Commodore is currently keeping his name under wraps) will soon appear on the scene.

The people at Commodore are enthusiastic about their product and confident about the future. The PET, after all, is the No. 1 seller in Europe and the second seller in the United States. They intend to be the first in both markets; Commodore insiders say they will break the $100 million sales mark in 1980.

This past year Commodore introduced a new model with a vastly improved keyboard. The PET monitor has been upgraded from a 9-inch, 40 column by 25 rows to a 12-inch, 80 column by 25 rows. Low-cost single and dual-floppy disks with systems capacity of up to two megabytes, hard disk systems with capacity of up to 30 megabytes, and low cost modems have also been added. On the very near horizon are a low-cost thermal printer and a letter quality printer. These features, combined with greatly expanded business and accounting software, including Mailing List, General Ledger and a word processor, are expected to open the business market to PET.

The people at Commodore are confident that they have the best machine on the market, and they cite a number of reasons why this is so:

Commodore owns its own semiconductor company. Con-

sistent with a strategy of vertical integration to fulfill the internal demands of Commodore, CMOS Technology produces the semiconductor devices used in the PET and its peripheral equipment.

"We're the only people competing in this business," said Gary Summers, Vice President of Engineering, "who have our own semiconductor business. The result of this is that we have an advantage in price."

Commodore is dealer-served. From the beginning, the PET was designed to be retailed by a non-specialized retailer. Commodore was highly selective of its dealers, requiring a service technician, a strong credit history and a cash deposit. In 1979 Commodore appointed five regional distributors to provide marketing and technical support to smaller dealers. The overall concept of buying and servicing a PET is much like that of buying and servicing a stereo: the customer buys a stereo in a certain store and, when something goes wrong with it, brings it back to that store for repair.

Commodore has concentrated on quality. Lawrence Perry, Commodore's Director of Marketing Support, cites any number of examples to illustrate the way he thinks the PET is a superior product.

"For example," said Perry, "our diskette box has its own microprocessor and memory and doesn't take up space a user would need for programming. When we say we're giving a dedicated 32K bytes, we give a full 32K bytes."

Perry and Summers constantly sprinkle the conversation with the advantages of the PET over other machines: the low-cost cassette has data integrity which is unmatched; with an IEEE engineering interface, the PET is right at home in the laboratory; Commodore can offer excellence in a line which spans the small portable to the standalone system; a recently developed modem device will allow hookup with other computers via telephone — a strong potential for networking; and, last but not least, Commodore can offer twice the capacity on floppy than anybody else.

The PET has had two disadvantages in the eyes of the rest of the world: an inconvenient keyboard which was totally useless for actual typing, and a lack of color. As previously mentioned, a fully standard new keyboard has been introduced. Commodore says to expect a color product in the not-too-distant future.

Commodore is still fully supporting its hobbyist market. An ever-expanding range of software is available, including:

- BASIC BASIC — a tutorial program introducing you to the BASIC language in a self-paced way.
- Application Programs which include a Stock Portfolio Analysis Package, a Basic Math Package which turns the PET into an interactive calculator, a disassembler, checkbook, word processor and database utility.
- Entertainment programs which include everything ranging from A Treasure Trove of Games for young people to the more sophisticated Draw Poker and Black Jack. In between, the gamesplayer can find Galaxy Games, Target Pong, Backgammon and Spacetrek.
- Other software programs allow the user to compute biorhythms, plan diets, prepare a schedule of depreciation, figure mortgage rates, learn the names and shapes of the 50 states, learn the alphabet and calculate a savings program.

Peddle alludes to the fact that private software houses are springing up, providing a limitless possibility as to the kinds of software that will someday be available.

"I'd like to stress," Peddle said, "that any programmer worth his salt could knock down $50,000 a year by writing different programs for all these machines. Some guy could make a killing in a cottage industry like that, and I can't believe nobody's doing it."

Commodore will continue its strong commitment to the educational market. In 1979, Commodore instituted a policy whereby, for every two 8K PETs bought by a school, they would give the school another PET for free.

And what lies ahead in Commodore's future? Speculation is that Commodore will soon develop a system which can talk, listen and draw.

"Well," says Peddle, smiling mysteriously. "We have lots of things bubbling in the background but we can't talk about them. I guess you could say we're in a rounding out, finishing up process right now. We are still a computer for one person to use to solve one problem. People are waiting for the next generation of computers. In the next year there will be a fundamental change in the way people use the computer, and we expect to be a major factor in that change."□

Using Special BASIC Functions

By Ted Carter

With the advent of the self-contained microcomputer, there has come a whole new set of special BASIC functions that did not exist before. In this article I will try to explain the use of the CHR$, POKE, PEEK, INP and OUT functions, as well as giving some tricks and interesting uses that you may not have thought of.

CHR$ FUNCTION

The CHR$ function is used to return the character string represented by the number in parentheses after the CHR$. For example, the program 10 PRINT CHR$(83) would print an "S" when run because the ASCII code for a capital "S" is 83. And every character that you can enter from the keyboard, as well as some you can't, is represented by a certain ASCII number. The meaning of all the ASCII numbers is shown in Figure 1.

Not only can this function be used in a PRINT statement, but you can LET A$=CHR$(83) which would make A$ equal to the letter "S". One of the most useful ways to implement this function is to clear the screen on a video monitor. The statement PRINT CHR$(12) does this task.

As can be seen in Figure 1, the CHR$( ) function can also be used to print lowercase or special characters not found on most keyboards. By running the program below you can have the computer print every character with an ASCII code. Don't be surprised when the screen is blanked when X = 12. (ASCII numbers 1-32 are control characters and will not print anything.) If the value of X went above 255, the character set would repeat.

```
10 FOR X=1 TO 255
20 PRINT CHR$(X),
30 NEXT X
```

POKE FUNCTION

By definition, the POKE function is used to modify a specific memory byte location. This may not mean much to those who don't program in machine and assembly language, but the POKE function can be used to place any character, including graphics characters, anywhere on the display screen.

The POKE function takes the form "POKE(memory/screen location), code of what is to be poked." To use it to place a character on the screen, you must know where the video memory starts. With A00 BASIC it starts at location 63488; with disk versions of Poly BASIC, it starts at 6144.

To see how the POKE function is used, try running the following program:

```
10 FOR X=1 TO 1024
20 POKE (63488+X),X
30 NEXT X
```

(Replace "63488" with "6144" for use with disk BASIC; replace with "15360" if you have a TRS-80.) In the program, the memory/screen location being modified is incremented each time X is, while the character being displayed is also changed at the same time. Notice that the character repeats, even though a different number is actually stored in the screen memory. For rough, but fast graphics you can use POKE (63488+X+64*(16-Y)),64 which will put a block at point X,Y where X is between 0 and 64, and Y is between 0 and 16.

PEEK FUNCTION

Instead of putting something into memory, the PEEK function examines what is in a certain memory location, and returns the code of what is stored there. If you added the following lines to the program in the section above

```
40 PLOT 0,33,0
50 FOR X=1 TO 192
60 PRINT PEEK(63488+X),
70 NEXT X
```

lines 10 to 30 would fill the screen memory with all the characters, and then lines 40 to 70 would print out the numbers 1 to 192 because that is what lines 10 to 30 put into the section of memory that stores what is on the video screen.

INP FUNCTION

The INP function is used to see what is in the input ports. In the Poly, the input port that is of greatest interest is the one that communicates with the keyboard. The port addresses 0,1, and 2 return data regarding the keyboard type-ahead.

Numbers and Letters of the Alphabet

0	--	48	V	--	86	α	--	128
1	--	49	W	--	87	δ	--	131
2	--	50	X	--	88	η	--	134
3	--	51	Y	--	89	κ	--	137
4	--	52	Z	--	90	ν	--	140
5	--	53	a	--	97	π	--	143
6	--	54	b	--	98	τ	--	146
7	--	55	c	--	99	χ	--	149
8	--	56	d	--	100	Ω	--	152
9	--	57	e	--	101			
A	--	65	f	--	102			
B	--	66	g	--	103			
C	--	67	h	--	104	β	--	129
D	--	68	i	--	105	ε	--	132
E	--	69	j	--	106	θ	--	135
F	--	70	k	--	107	λ	--	138
G	--	71	l	--	108	ξ	--	141
H	--	72	m	--	109	ρ	--	144
I	--	73	n	--	110	υ	--	147
J	--	74	o	--	111	ψ	--	150
K	--	75	p	--	112			
L	--	76	q	--	113			
M	--	77	r	--	114			
N	--	78	s	--	115	γ	--	130
O	--	79	t	--	116	ζ	--	133
P	--	80	u	--	117	ι	--	136
Q	--	81	v	--	118	μ	--	139
R	--	82	w	--	119	ο	--	142
S	--	83	x	--	120	σ	--	145
T	--	84	y	--	121	φ	--	148
U	--	85	z	--	122	ω	--	151

Special Symbols

!	--	33	?	--	63
"	--	34	@	--	64
#	--	35	[	--	91
$	--	36	\	--	92
%	--	37	]	--	93
&	--	38	^	--	94
'	--	39	-	--	95
(	--	40	`	--	96
)	--	41	{	--	123
*	--	42	|	--	124
+	--	43	}	--	125
,	--	44	~	--	126
-	--	45	√	--	153
.	--	46	÷	--	154
/	--	47	÷	--	155
:	--	58	†	--	156
;	--	59	÷	--	157
<	--	60	Σ	--	158
=	--	61	≈	--	159
>	--	62			

INP(0) returns the status of the type-ahead buffer; 0 if the buffer is empty, and 1 if there is at least one character in the input buffer. INP(1) takes the first character out of the input buffer and returns the ASCII code of the character without printing the character on the screen; INP(2) does the very same thing except that it prints the character on the screen. (NOTE: INP(2) is not allowed with Poly disk BASIC — you must say PRINT CHR$(INP(1)).)

One way to use the INP function is to have a program running without printing anything until you hit a key. For example, the program:

```
10 X=X+1
20 IF INP(0)=0 THEN 10
30 PRINT X\Z=INP(1)
40 GOTO 10
```

will sit there and increment the value of X until you hit a key. When this happens, INP(0) becomes 1 so line 30 is executed. Line 30 prints the current value of X and then takes the character out of the input buffer so INP(0) will be zero for the next loop.

You can also use INP(1) when you are waiting for the user to finish reading instructions or writing something down before continuing. The line:

```
10 PRINT" Hit any key to continue. . ."\Z=INP(1)
```

will cause the computer to stop until something has been typed.

You can also use INP(1) to test for Yes/No answers so that the user can type either Y or N without hitting a carriage return. The following lines will take the character types and test to see if it is the ASCII number for Y (89) or N (78); if the character typed is neither a Y or N, the program goes back and waits for the proper letter to be typed.

```
100 PRINT" Do you want to play again ? ",
110 Z=INP(1)\IF Z=89 THEN 10
      ELSE IF Z< >78 THEN 110
120 STOP
```

OUT FUNCTION

The OUT function places characters out to the various ports. In the Poly the port of the greatest interest, however, is the one used for the keyboard — port #0. The statement OUT 0,val places the ASCII character with integer value val into the keyboard type-ahead input buffer. It should be noted that an attempt to place characters into the input buffer when it is full will be ignored. Printing a control-X character will flush the input type-ahead buffer.

The program below demonstrates a use of the OUT function.

```
10 Z=FNX("LIST")+FNX("SCR")+FNX("LIST")
20 STOP
30 DEF FNX(A$)
40 FOR A=1 TO LEN(A$) B=ASC(A$(A,A))
     OUT 0,B NEXT
50 OUT 0,13 RETURN 0
60 FNEND
```

When this program is run it will list itself, scratch itself, and then list what is there which is nothing since the program scratched itself. Line 10 in the above program uses the defined function FNX to put the words "LIST", "SCR", and then "LIST" into the type-ahead keyboard input buffer. Then when the program stops in line 20, what has been output to the type-ahead buffer is used by the computer.

With some careful thinking, you can have a program actually stop, modify itself, and then "RUN" again.□

The Personal Financial Statement

By John Sparti

This program was written for the PolyMorphic System 8813. Once programmed, it can lead a non-computer person through the maze of a financial statement. It will then print out a hard copy. This may be presented as part of a financial package to the prospective lender.

Even fortunate people who have an adequate bank balance occasionally find themselves in a situation in which they wish to utilize outside funds rather than disturb their savings. Banks generally require a financial statement on almost all loans greater than $5,000. With money as tight as it is today, this limit may drop considerably.

Simply stated, the financial statement is a prepared document which lists one's assets and one's liabilities. It is analyzed by lending institutions to determine an individual's strength as a borrower. As facetious as it sounds, "bankers lend money to those who don't need it."

The following program was written to help in preparation of a personalized financial statement. It was designed for those individuals who own or have access to a personal computer or for the patrons of banks, financial consultants, financial brokers, CPAs and accountants. It will lead a person who is unfamiliar with computers through the maze of questions involved with a financial statement and provide hardcopy for the lender.

Before going further in the actual preparation of the financial statement, let's review what the lender will be using to analyze your statement. Number one, the financial strength equation: liabilities + capital = assets. Are they current or long term liabilities: due within one year or due after one year? Are they fixed or current assets: permanent items or liquid items?

Number two, is the comparison of data vertical and horizontal: does the data on your statement 'add up,' and how does it compare with previous statements or statements of persons with similar financial circumstances? Remember your lender will be looking at many ratios and trends. These can be found in the books on analysis of financial statements. In general, trends are most important.

When you run the program, your assets and liabilities will be listed. By subtracting your debts from your assets, you will come up with your net worth. This is the portion the banker will look at closely.

The program which follows will guide you through the difficulties and remind you of some of the things which you might otherwise forget.□

Program follows

PROGRAM LISTING

```
1000 ON ESCAPE GOTO 4150
1010 REM FINANCIAL STATEMENT BY JOHN SPARTI 4,10,79 BASIC COOL
1020 REM POLYMORPHIC 8813 & 88/MS - DECWRITER II
1030 REM Further Modified by  Roger P.Ford - 6/5/79
1040 REM No Reproduction can be made without written
1050 REM granted permission by author
1060 REM No warranty or guarantee is expressed or implied
1070 REM MEDICOMP APPLICATIONS
1080 REM 318 Main St. - Dallas,Ga. 30132 - (404)445-5555
1090 DIM0
1100 DIM A$(10:64),B$(5:64),C$(5:64),I1$(12:64),A8$(1:30)
1110 DIM D$(5:64),E$(12:64),E1$(8:64),G1$(8:64),H1$(6:64)
1120 DIM G(10),D2$(1:15),Z$(1:4),X$(1:2)
1130 X$=CHR$(12)
1140 REM ************************************************
1150 REM *                                              *
1160 REM *              Output  Section                 *
1170 REM *                                              *
1180 REM ************************************************
1190 PRINT CHR$(12),"Will this statement be"
1200 PRINT TAB(10),"1 --- Listed on Printer Only"
1210 PRINT TAB(10),"2 --- Saved on File"
1220 PRINT TAB(10),"3 --- Listed on Printer and"
1230 PRINT TAB(16),"Saved on File"
1240 INPUT "Which ",Z5\Z6=2\Z7=4
1250 IF Z5<1 OR Z5>3 OR Z5<>INT(Z5) THEN 1190
1260 IF Z5=1 THEN Z7=2 ELSE IF Z5=2 THEN Z6=4
1270 REM ************************************************
1280 REM *                                              *
1290 REM *              New Statement                   *
1300 REM *                Section                       *
1310 REM *                                              *
1320 REM ************************************************
1330 PRINT X$
1340 INPUT "Date ",D2$
1350 PRINT "ASSETS",TAB(46),"DOLLARS/CENTS"
1360 PRINT "Financial Statement regarding:",\Z4=0
1370 INPUT "Initials ",A8$
1380 PRINT "TYPE IN FIGURES WITHOUT COMMAS OR `$' !!!!"
1390 REM ************************************************
1400 REM *                                              *
1410 REM *              Input Assets(Receivables)       *
1420 REM *                 Section                      *
1430 REM *                                              *
1440 REM ************************************************
1450 PRINT
1460 INPUT "Cash In Banks  ",A
1470 INPUT "Listed Securities ",B
1480 INPUT "Accounts and Loans Recieveable ",C
1490 INPUT "Real Estate & Residence ",D
1500 INPUT "Other Real Estate Owned ",E
1510 INPUT "How many Auto's do you own ",F
1520 FOR F1= 1 TO F\IF F1 =0 THEN EXIT 1550
1530 INPUT "Auto Value ",G(F1)
1540 NEXT
1550 INPUT "Life Insurance - Cash Value ",H
1560 INPUT "Mortgages & Contracts Owned ",I
1570 PRINT "Other Assets Itemize Separately"
1580 INPUT "Total of Other Assets ",Z2
1590 REM ************************************************
1600 REM *                                              *
1610 REM *              Input Liabilities               *
1620 REM *                   Section                    *
1630 REM *                                              *
1640 REM ************************************************
1650 PRINT X$,"LIABILITIES",TAB(46),"DOLLARS/CENTS"
1660 INPUT "Secured Banks ",J
1670 INPUT "Unsecured Banks ",K
1680 INPUT "Accounts and Bills Due ",L
1690 INPUT "Income Taxes Due  ",M
1700 INPUT "Other Taxes Due ",N
1710 INPUT "Mortgage on Residence ",O
1720 INPUT "Other Real Estate Mortgages ",P
1730 INPUT "Notes Payable to Relatives ",Q
1740 INPUT "Total of Other Debts ",Q2
1750 PRINT "ITEMIZE ALL OTHER DEBTS FROM ABOVE TOTAL",
1760 PRINT " SEPARATELY"
1770 PRINT "Type any Character to continue.",\WAIT\PRINT
1780 REM ************************************************
1790 REM *                                              *
1800 REM *              Input Income                    *
1810 REM *                 Section                      *
1820 REM *                                              *
1830 REM ************************************************
1840 PRINT X$,"ANNUAL INCOME",TAB(45),"DOLLARS/CENTS"
1850 INPUT "Salary ",R
1860 INPUT "Bonus and Commissions ",S
1870 INPUT "Dividends ",T
1880 INPUT "Real Estate Income ",U
1890 INPUT "Spouse's Income ",V
1900 INPUT "Alimony, Child Support, or Separate Maintenance ",W
1910 PRINT X$,"EST. OF ANNUAL EXPENSE",TAB(46),"DOLLARS"
1920 INPUT "Income Taxes ",X
1930 INPUT "Other Taxes ",Y
1940 INPUT "Insurance Premiums ",Z
1950 INPUT "Mortgage Payments ",A1
1960 INPUT "Rent on Business Property ",B1
1970 INPUT "Total Monthly Installments Other Than Above ",A2
1980 PRINT "Annual Total Living Expense (Clothing, Groceries"
1990 INPUT "Utilities) ",B2
2000 PRINT X$,"BANK ACCOUNTS"
2010 INPUT "How many Bank Accounts Do You Have ",C1
2020 FOR D1 = 1 TO C1
2030 PRINT "Names and Addresses of Banks/Acc't #/Balance"
2040 INPUT " ",A$(D1)
2050 NEXT
2060 REM ************************************************
2070 REM *                                              *
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```
2080 REM *                Payable                        *
2090 REM *                Section                        *
2100 REM *                                               *
2110 REM *************************************************
2120 PRINT X$,"PAYABLES"
2130 INPUT "How many Secured Notes Do You Have Outstanding ",R7
2140 FOR I5=1 TO R7
2150 PRINT "Secured Notes "\INPUT " ",E1$(I5)
2160 NEXT
2170 PRINT "How Many Unsecured Notes Do You Have ",
2180 INPUT "Outstanding ",R8
2190 FOR I6=1 TO R8
2200 PRINT "Unsecured notes  "\INPUT " ",G1$(I6)
2210 NEXT
2220 INPUT "How Many Contracts to Banks Do You Have ",R9
2230 FOR I7=1 TO R9
2240 PRINT "Contracts to Banks  "\INPUT " ",H1$(I7)
2250 NEXT
2260 INPUT "How Many Installment Debts Do You Have Out ",R0
2270 FOR I8=1 TO R0
2280 PRINT "Installment Debts "\INPUT " ",I1$(I8)
2290 NEXT
2300 PRINT X$,
2310 PRINT "CONTINGENT LIABILITIES: AS ENDORSER ON LEASES"
2320 PRINT"OR CONTRACTS, FOR LEGAL CLAIMS, OR OTHER (DESCRIBE)"
2330 INPUT "How Many Continsent Liabilities Do You Have  ",J1
2340 FOR K1 = 1 TO J1
2350 PRINT "Due to Address/Acct#/Sec. Pledged/Unpd Bal./Mo.pay"
2360 INPUT " ",B$(K1)
2370 NEXT
2380 PRINT X$,"SCHEDULE OF LIFE INSURANCE CARRIED"
2390 INPUT "How Many Life Insurance Policies Do you Carry ",L1
2400 FOR M1 = 1 TO L1
2410 PRINT "Name of Co./Amt/Cash value/Amt.Borrowed "
2420 INPUT " ",C$(M1)
2430 NEXT
2440 PRINT X$,"REAL ESTATE,MORTGAGES, AND CONTRACTS OWNED"
2450 INPUT "How Many Locations & Contracts Do You Own ",N1
2460 IF N1=0 THEN 2530
2470 PRINT "Location & Type of Structure/Title in Name of"
2480 PRINT "Purchase Date Est.Value/Amount Owing"
2490 PRINT "To Whom Payable"
2500 FOR O1 = 1 TO N1
2510 PRINT "Location or Contract #",O1,\INPUT " ",D$(O1)
2520 NEXT
2530 PRINT X$,"SCHEDULE OF STOCKS, BONDS AND SECURITIES"
2540 INPUT"How Many Types (Stock,Bonds or Sec.) Do You Own ",P1
2550 PRINT "Description",TAB(46),"Market"
2560 FOR Q1=1 TO P1
2570 PRINT"Face Value-Bonds/# of Shares-Stocks/Cost/Curr Value"
2580 INPUT " ",E$(Q1)
2590 NEXT
2600 REM *************************************************
2610 REM *                                               *
```

```
3170 PRINT:Z8,"Accounts and Bills Due",TAB(41),L
3180 PRINT:Z8,"Income Taxes Due",TAB(41),M
3190 PRINT:Z8,"Other Taxes Due",TAB(41),N
3200 PRINT:Z8,"Mortgage on Residence",TAB(41),O
3210 PRINT:Z8,"Other Real Estate Mortgages",TAB(41),P
3220 PRINT:Z8,"Notes Payable to Relatives",TAB(41),Q
3230 PRINT:Z8,"Other Debts-ITEMIZE-You Must ",
3240 PRINT:Z8,"List All Your Debts"
3250 PRINT:Z8,"Use Additional Sheet ",TAB(41),Q2
3260 L9=J+K+L+M+N+O+P+Q+Q2\GOSUB 4050
3270 PRINT:Z8,"TOTAL LIABILITIES",TAB(41),L9\PRINT:Z8,""
3280 GOSUB 4050\W9=A9-L9
3290 PRINT:Z8,"NET WORTH",TAB(41),W9\PRINT:Z8,""
3300 GOSUB 4050\GOSUB 4050
3310 PRINT:Z8,"ANNUAL INCOME",TAB(41),"DOLLARS"
3320 GOSUB 4050\PRINT:Z8,"Salary",TAB(41),R
3330 PRINT:Z8,"Bonus and Commissions",TAB(41),S
3340 PRINT:Z8,"Dividends",TAB(41),T
3350 PRINT:Z8,"Real Estate Income",TAB(41),U
3360 PRINT:Z8,"Spouse's Income",TAB(41),V
3370 PRINT:Z8,"Alimony, Child Support, or"
3380 PRINT:Z8,"Separate Maintenance",TAB(41),W
3390 J9=R+S+T+U+V+W\GOSUB 4050
3400 PRINT:Z8,"TOTAL",TAB(41),J9\PRINT:Z8,""
3410 GOSUB 4050\GOSUB 4050
3420 PRINT:Z8,"ESTIMATE OF ANNUAL EXPENSE DOLLARS"
3430 PRINT:Z8,"Income Taxes",TAB(41),X
3440 PRINT:Z8,"Other Taxes",TAB(41),Y
3450 PRINT:Z8,"Insurance Premiums",TAB(41),Z
3460 PRINT:Z8,"Mortgage Payments",TAB(41),A1
3470 PRINT:Z8,"Rent on Business Property",TAB(41),B1
3480 PRINT:Z8,"Monthly Installments Other"
3490 PRINT:Z8,"Than Above-Annual Total",TAB(41),A2
3500 PRINT:Z8,"Living Expense (Clothing,"
3510 PRINT:Z8,"Groceries, Utilities,Etc.)",TAB(41),B2
3520 K9=X+Y+Z+A1+B1+A2+B2\GOSUB 4050
3530 PRINT:Z8,"TOTAL ",TAB(41),K9\PRINT:Z8,""
3540 GOSUB 4050\GOSUB 4050\IF C1=0 THEN 3600
3550 PRINT:Z8,"BANK ACCOUNTS",TAB(41),%3I,C1
3560 PRINT:Z8,"NAMES AND ADDRESSES OF BANKS"
3570 FOR V8=1 TO C1
3580 PRINT:Z8,A$(V8)
3590 NEXT\GOSUB 4050
3600 IF R7=0 THEN 3640
3610 FOR V4=1 TO R7
3620 PRINT:Z8,"SECURED NOTES"\PRINT:Z8,E1$(V4)
3630 NEXT\GOSUB 4050
3640 IF R8=0 THEN 3680
3650 FOR V5=1TO R8
3660 PRINT:Z8,"Unsecured Notes"\PRINT:Z8,G1$(V5)
3670 NEXT\GOSUB 4050
3680 IF R9=0 THEN 3720
3690 FOR V6=1 TO R9
3700 PRINT:Z8,"Contracts to Banks"\PRINT:Z8,H1$(V6)
3710 NEXT\GOSUB 4050
```

```
2620 REM *                General Legal Data                *
2630 REM *                     Section                      *
2640 REM *                                                  *
2650 REM ************************************************
2660 PRINT X$,"GENERAL INFORMATION"
2670 INPUT "Are You a Guarantor on Anyone's Debt (Y or N) ",F$
2680 PRINT "If so, Give Details on Attached List"
2690 PRINT "Are There Any Suits or Judgements Now Pending"
2700 INPUT "Against You?(Y or N) ",G$
2710 PRINT "Have You Been Bankrupt(Corp.or Personal)(Y or N)",
2720 INPUT " ",H$
2730 PRINT "If So, Attach List of Co. With Whom Debts ",
2740 PRINT "Were Comprised."
2750 PRINT X$
2760 IF LEFT$(F$,1)="Y" THEN F$="YES" ELSE F$="NO"
2770 IF LEFT$(G$,1)="Y" THEN G$="YES" ELSE G$="NO"
2780 IF LEFT$(H$,1)="Y" THEN H$="YES" ELSE H$="NO"
2790 PRINT %#$C14F2
2800 K9$="FINANCIAL-STATEMENT-"+A8$
2810 REM ************************************************
2820 REM *                                                *
2830 REM *      Output Financial Statement                *
2840 REM *                Section                         *
2850 REM *                                                *
2860 REM ************************************************
2870 Z8=Z6
2880 FILE:2,LIST\IF Z4=0 AND Z8=4 THEN 2890 ELSE 2900
2890 FILE:Z8,OPEN,K9$,OUT\Z4=1
2900 PRINT:Z8,CHR$(12)
2910 GOSUB 4050\GOSUB 4050
2920 PRINT:Z8,"Financial Statement Regarding ",A8$,CHR$(13)
2930 PRINT:Z8,"Date of This Report Is ",D2$
2940 GOSUB 4050\GOSUB 4050
2950 PRINT:Z8,"ASSETS",TAB(46),"DOLLARS/CENTS"\GOSUB 4050
2960 PRINT:Z8,"Cash in Banks",TAB(41),A
2970 PRINT:Z8,"Listed Securities",TAB(41),B
2980 PRINT:Z8,"Accounts and Loans Recieveable",TAB(41),C
2990 PRINT:Z8,"Real Estate & Residence",TAB(41),D
3000 PRINT:Z8,"Other Real Estate Owned",TAB(41),E
3010 FOR L3 =1TO F
3020 PRINT:Z8,"Auto # ",%3I,L3," Value",TAB(41),%#$C14F2,G(L3)
3030 NEXT
3040 PRINT:Z8," Life Insurance - Cash Value",TAB(41),H
3050 PRINT:Z8,"Mortgages & Contracts Owned",TAB(41),I
3060 PRINT:Z8,"Other Assets Total",TAB(41),Z2
3070 T6=0
3080 A9=A+B+C+D+E+H+I+Z2
3090 FOR U8 = 1 TO F\T6=G(U8)+T6
3100 NEXT
3110 A9=A9+T6\GOSUB 4050
3120 PRINT:Z8,"TOTAL ASSETS",TAB(41),A9\PRINT:Z8,""
3130 GOSUB 4050\GOSUB 4050
3140 PRINT:Z8,"LIABILITIES",TAB(46),"DOLLARS/CENTS"
3150 PRINT:Z8,"Secured Banks",TAB(41),J
3160 PRINT:Z8,"Unsecured Banks",TAB(41),K
3720 IF R0=0 THEN 3760
3730 FOR V7=1 TO R0
3740 PRINT:Z8,"Installment Debts"\PRINT:Z8,I1$(V7)
3750 NEXT\GOSUB 4050
3760 PRINT:Z8,"CONTINGENT LIABILITIES: As Endorser or"
3770 PRINT:Z8,"Co-Makers, on Leases or Contracts, for"
3780 PRINT:Z8,"Legal Claims, or Other"
3790 FOR K4 =1 TO J1
3800 PRINT:Z8,CHR$(13), B$(K4)
3810 NEXT\GOSUB 4050\GOSUB 4050
3820 PRINT:Z8,"LIFE INSURANCE CARRIED"
3830 FOR M4 = 1 TO L1
3840 PRINT:Z8,CHR$(13),C$(M4)
3850 NEXT\GOSUB 4050
3860 PRINT:Z8,"Real Estate,Mortgages, and Contracts owned"
3870 FOR O4 = 1 TO N1
3880 PRINT:Z8,CHR$(13),D$(O4)
3890 NEXT\GOSUB 4050
3900 PRINT:Z8,"SCHEDULE OF STOCKS, BONDS, AND SECURITIES"
3910 FOR Q4 = 1 TO P1
3920 PRINT:Z8,CHR$(13),E$(Q4)
3930 NEXT\GOSUB 4050\GOSUB 4050
3940 PRINT:Z8,"GENERAL INFORMATION"
3950 GOSUB 4050
3960 PRINT:Z8,"Are you A Guarantor on Anyone's Debt ",F$
3970 PRINT:Z8,"If so, Give Details on Attached List"
3980 PRINT:Z8,"Are There Any Suits or Judgements Now Pending"
3990 PRINT:Z8,"Against You ",G$
4000 PRINT:Z8,"Have You Been Bankrupt(Corp.or Personal) ",H$
4010 PRINT:Z8,"If So, Attach List of Co. With Whom Debts ",
4020 PRINT:Z8,"Were Comprised."
4030 IF Z8=4 THEN FILE:Z8,CLOSE
4040 Z8=Z8+2\IF Z8<=Z7 THEN 2880 ELSE GOTO 4150
4050 PRINT:Z8, ".....",
4060 PRINT:Z8,".....",CHR$(13)
4070 RETURN
4080 REM ************************************************
4090 REM *                                                *
4100 REM *              Correction Section                *
4110 REM *       If the Interrupt Key is pressed          *
4120 REM *          BASIC will branch here                *
4130 REM *                                                *
4140 REM ************************************************
4150 PRINT CHR$(12),TAB(15),"Corrections"
4160 PRINT CHR$(13),"To make a correction, enter the number"
4170 PRINT "corresponding to the section in which the error"
4180 PRINT "was made"\PRINT
4190 PRINT "NOTE!!!! - You must reenter all the data in that"
4200 PRINT "section."\PRINT
4210 PRINT "Type any key to continue...",\WAIT
4220 PRINT X$,TAB(15),"Corrections"\PRINT
4230 PRINT "1.Assets              2.Liabilities"
4240 PRINT "3.Annual Income       4.Est. Expense"
4250 PRINT "5.Bank Accounts       6.Sec./Unsec.Notes/Contracts"
4260 PRINT "7.Contingent Liab.    8.Life Insurance"
4270 PRINT "9.Real Estate        10.Stocks & Bonds"
```

```
4280 PRINT "11.General Info.    12.Repeat Printout"
4290 PRINT "13..Exit The Program"
4300 PRINT\INPUT "Function ",Z$
4310 Z9=0
4320 FOR I1=1 TO LEN(Z$)
4330 I2=ASC(Z$,I1)-48
4340 IF I2<0 OR I2>9 THEN EXIT 4220
4350 Z9=Z9*10+I2
4360 NEXT\IF Z9<1 OR Z9>13 THEN 4220
4370 IF Z9>9 THEN 4390
4380 ON Z9 GOTO 1330,1650,1840,1910,2000,2120,2300,2380,2440
4390 ON Z9-9 GOTO 2530,2660,2750,4400
4400 OUT0,"BYE"+CHR$(13)
4410 REM End of Program.....
A1
  1950   3460   3520

A2
  1970   3490   3520

A9
  3080   3110   3120   3280
A
  1460   2960   3080

B1
  1960   3470   3520

B2
  1990   3510   3520

B
  1470   2970   3080

C1
  2010   2020   2790   3020   3540   3550   3570
C
  1480   2980   3080

D1
  2020   2040

D
  1490   2990   3080

E
  1500   3000   3080
F1
  1520   1530

F2
  2790   3020

F
  1510   1520   3010   3090

M1
  2400   2420

M4
  3830   3840

M
  1690   3180   3260

N1
  2450   2460   2500   3870
N
  1700   3190   3260

O1
  2500   2510

O4
  3870   3880

O
  1710   3200   3260

P1
  2540   2560   3910

P
  1720   3210   3260
Q1
  2560   2580

Q2
  1740   3250   3260

Q4
  3910   3920

Q
  1730   3220   3260
R0
  2260   2270   3720   3730

R7
  2130   2140   3600   3610

R8
  2180   2190   3640   3650

R9
  2220   2230   3680   3690

R
  1850   3320   3390
S
  1860   3330   3390
```

```
G
  1120   1530   3020   3090

H
  1550   3040   3080

I1
  4320   4330
I2
  4330   4340   4350

I5
  2140   2150

I6
  2190   2200
I7
  2230   2240

I8
  2270   2280

I
  1560   3020   3050   3080   3550

J1
  2330   2340   3790

J9
  3390   3400
J
  1660   3150   3260

K1
  2340   2360

K4
  3790   3800

K9
  3520   3530
K
  1670   3160   3260

L1
  2390   2400   3830

L3
  3010   3020

L9
  3260   3270   3280

L
  1680   3170   3260

T6
  3070   3090   3110

T
  1870   3340   3390

U8
  3090

U
  1880   3350   3390

V4
  3610   3620
V5
  3650   3660

V6
  3690   3700

V7
  3730   3740

V8
  3570   3580
V
  1890   3360   3390

W9
  3280   3290

W
  1900   3380   3390

X
  1920   3430   3520

Y
  1930   3440   3520
Z2
  1580   3060   3080

Z4
  1360   2880   2890
Z5
  1240   1250   1260

Z6
  1240   1260   2870

Z7
  1240   1260   4040

Z8
  2870   2880   2890   2900   2920   2930   2950   2960   2970
```

```
2980   2990   3000   3020   3040   3050   3060   3120   3140
3150   3160   3170   3180   3190   3200   3210   3220   3230
3240   3250   3270   3290   3310   3320   3330   3340   3350
3360   3370   3380   3400   3420   3430   3440   3450   3460
3470   3480   3490   3500   3510   3530   3550   3560   3580
3620   3660   3700   3740   3760   3770   3780   3800   3820
3840   3860   3880   3900   3920   3940   3960   3970   3980
3990   4000   4010   4020   4030   4040   4050   4060
Z9
  4310   4350   4360   4370   4380   4390

Z
  1940   3450   3520

A8$
  1100   1370   2800   2920

A$
  1100   2040   3580
B$
  1100   2360   3800

C$
  1100   2420   3840

D2$
  1120   1340   2930

D$
  1110   2510   3880
E1$
  1110   2150   3620

E$
  1110   2580   3920

F$
  2670   2760   3960

G1$
  1110   2200   3660
G$
  2700   2770   3990

H1$
  1110   2240   3700

H$
  2720   2780   4000

I1$
  1100   2280   3740
K9$
  2800   2890
```



```
NOTE!!!! - You must reenter all the data in that
section.

Type any key to continue...Waiting...

                                        Corrections

1.Assets                2.Liabilities
3.Annual Income         4.Est. Expense
5.Bank Accounts         6.Sec./Unsec.Notes/Contracts
7.Contingent Liab.      8.Life Insurance
9.Real Estate          10.Stocks & Bonds
11.General Info.       12.Repeat Printout
13..Exit The Program
Function 4

EST. OF ANNUAL EXPENSE                          DOLLARS
Income Taxes 15000
Other Taxes 1000
Insurance Premiums 2000
Mortgage Payments 240
Rent on Business Property 0
EST. OF ANNUAL EXPENSE                          DOLLARS
Income Taxes 15000
Other Taxes 1000
Insurance Premiums 2000
Mortgage Payments 3000
Rent on Business Property 0
Total Monthly Installments Other Than Above 1000
Annual Total Living Expense (Clothing, Groceries
Utilities) 15000
BANK ACCOUNTS
How many Bank Accounts Do You Have 4
Names and Addresses of Banks/Acc't #/Balance
 FNB  ANYTOW N  GA        5648254       4000
Names and Addresses of Banks/Acc't #/Balance
 FNB ANY TOWN GA          7321984       2000
Names and Addresses of Banks/Acc't #/Balance
 FNB ANY TOWN  GA        6573287          10
Names and Addresses of Banks/Acc't #/Balance
 FNB ANYTOWN GA          987642             5
PAYABLES
How many Secured Notes Do You Have Outstanding 1
Secured Notes
 FNB ANYTOWN  ACT# 9874321567     10000      4YR  OFFICE
                                                 EQUIPMENT
How Many Unsecured Notes Do You Have Outstanding 1
Unsecured notes
 FNB ANYTOWN     ACT# 1234567890     2000     1 YR  VACATION
How Many Contracts to Banks Do You Have 0
How Many Installment Debts Do You Have Out 2
Installment Debts
 SEARS          765443980          400        REVOLVING  TV
Installment Debts
 FURNITURE STORE  ANYTOWN   5432289   300    REVOLVINTG BED
```

```
X$
  1120   1130   1330   1650   1840   1910   2000   2120   2300
  2380   2440   2530   2660   2750   4220

Z$
  1120   4300   4320   4330
 REENTER
>RUN
Will this statement be
          1 --- Listed on Printer Only
          2 --- Saved on File
          3 --- Listed on Printer and
                Saved on File
Which 1
Date 6/17/79
ASSETS                                          DOLLARS/CENTS
Financial Statement regarding:Initials JD
TYPE IN FIGURES WITHOUT COMMAS OR `$' !!!!
Cash In Banks  6000
Listed Securities 1000
Accounts and Loans Recieveable 15000
Real Estate & Residence 45000
Other Real Estate Owned 10000
How many Auto's do you own 2
Auto Value 20000
Auto Value 13500
Life Insurance - Cash Value 10000
Mortgages & Contracts Owned 0
Other Assets Itemize Separately
Total of Other Assets 100000
LIABILITIES                                     DOLLARS/CENTS
Secured Banks 10000
Unsecured Banks 2000
Accounts and Bills Due 2000
Income Taxes Due  0
Other Taxes Due 0
Mortgage on Residence 30000
Other Real Estate Mortgages 50000
Notes Payable to Relatives 25
Total of Other Debts 0
ITEMIZE ALL OTHER DEBTS FROM ABOVE TOTAL SEPARATELY
Type any Character to continue,Waiting...

ANNUAL INCOME                                   DOLLARS/CENTS
Salary 50000
Bonus and Commissions 5000
Dividends 25
Real Estate Income 1000
Spouse's Income 5000
Alimony, Child Support, or Separate Maintenance 0
                        Corrections

To make a correction, enter the number
corresponding to the section in which the error
was made
```

```
CONTINGENT LIABILITIES: AS ENDORSER ON LEASES
OR CONTRACTS, FOR LEGAL CLAIMS, OR OTHER (DESCRIBE)
How Many Contingent Liabilities Do You Have  0
SCHEDULE OF LIFE INSURANCE CARRIED
How Many Life Insurance Policies Do you Carry 1
Name of Co./Amt/Cash value/Amt.Borrowed
 LIFE  OF GA
REAL ESTATE,MORTGAGES, AND CONTRACTS OWNED
How Many Locations & Contracts Do You Own 0
SCHEDULE OF STOCKS, BONDS AND SECURITIES
How Many Types (Stock,Bonds or Sec.) Do You Own 1
Description                                     Market
Face Value-Bonds/# of Shares-Stocks/Cost/Curr Value
 BLL  1000   250    1000      1000
GENERAL INFORMATION
Are You a Guarantor on Anyone's Debt (Y or N) N
If so, Give Details on Attached List
Are There Any Suits or Judgements Now Pending
Against You?(Y or N) N
Have You Been Bankrupt(Corp.or Personal)(Y or N) N
If So, Attach List of Co. With Whom Debts Were Comprised.
                Corrections

1.Assets              2.Liabilities
3.Annual Income       4.Est. Expense
5.Bank Accounts       6.Sec./Unsec.Notes/Contracts
7.Contingent Liab.    8.Life Insurance
9.Real Estate        10.Stocks & Bonds
11.General Info.     12.Repeat Printout
13..Exit The Program

Function 13
>BYE
(Exec/78)
$PAGE
                Corrections

To make a correction, enter the number
corresponding to the section in which the error
was made

NOTE!!!! - You must reenter all the data in that
section.

Type any key to continue...Waiting...
.....................................................

Financial Statement Regarding JD

Date of This Report Is 6/17/79
.....................................................

ASSETS                                          DOLLARS/CENTS
```

Cash in Banks	$6,000.00
Listed Securities	$1,000.00
Accounts and Loans Recieveable	$15,000.00
Real Estate & Residence	$45,000.00
Other Real Estate Owned	$10,000.00
Auto # 1 Value	$20,000.00
Auto # 2 Value	$13,500.00
Life Insurance - Cash Value	$10,000.00
Mortgages & Contracts Owned	$.00
Other Assets Total	$100,000.00
TOTAL ASSETS	$220,500.00

LIABILITIES	DOLLARS/CENTS
Secured Banks	$10,000.00
Unsecured Banks	$2,000.00
Accounts and Bills Due	$2,000.00
Income Taxes Due	$.00
Other Taxes Due	$.00
Mortgage on Residence	$30,000.00
Other Real Estate Mortgages	$5,000.00
Notes Payable to Relatives	$25.00
Other Debts-ITEMIZE-You Must List All Your Debts Use Additional Sheet	$.00
TOTAL LIABILITIES	$49,025.00
NET WORTH	$171,475.00

ANNUAL INCOME	DOLLARS
Salary	$50,000.00
Bonus and Commissions	$5,000.00
Dividends	$25.00
Real Estate Income	$1,000.00
Spouse's Income	$5,000.00
Alimony, Child Support, or Separate Maintenance	$.00
TOTAL	$61,025.00

ESTIMATE OF ANNUAL EXPENSE DOLLARS	
Income Taxes	$15,000.00
Other Taxes	$1,000.00
Insurance Premiums	$2,000.00
Mortgage Payments	$3,000.00
Rent on Business Property	$.00
Monthly Installments Other Than Above-Annual Total	$1,000.00
Living Expense (Clothing, Groceries, Utilities,Etc.)	$15,000.00
TOTAL	$37,000.00

BANK ACCOUNTS 4

NAMES AND ADDRESSES OF BANKS

FNB ANYTOWN GA	5648254	4000
FNB ANYTOWN GA	7321984	2000
FNB ANY TOWN GA	6573287	10
FNB ANYTOWN GA	987642	5

SECURED NOTES

FNB ANYTOWN ACT# 9874321567 10000 4YR OFFICE EQUIPMENT

Unsecured Notes

FNB ANYTOWN ACT# 1234567890 2000 1 YR VACATION

Installment Debts

SEARS 765443980 400 REVOLVING TV

Installment Debts

FURNITURE STORE ANYTOWN 5432289 300 REVOLVING BED

CONTINGENT LIABILITIES: As Endorser or Co-Makers, on Leases or Contracts, for Legal Claims, or Other

LIFE INSURANCE CARRIED

LIFE OF GA

Real Estate,Mortgages, and Contracts owned

SCHEDULE OF STOCKS, BONDS, AND SECURITIES

BLL 1000 250 1000 1000

GENERAL INFORMATION

Are you A Guarantor on Anyone's Debt NO
If so, Give Details on Attached List
Are There Any Suits or Judgements Now Pending Against You NO
Have You Been Bankrupt(Corp.or Personal) NO
If So, Attach List of Co. With Whom Debts Were Comprised.

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CIRCLE INQUIRY NO.37

Integral Data Systems, Inc.

Comfort, Convenience & Conservation

COMPUTERIZING THE HOME

By Terry Costlow, Editor

In some arenas, a hotly debated question is whether or not the 1980s will be the decade of the home computer. But a few businessmen are reaching farther, in hopes that it will be the decade of the computerized home.

Instead of building systems so the household members can play games and keep track of lists and calendars, these inventors are manufacturing systems that control many mundane but important functions of the home. With the aid of sensors and electrical wiring, the computers can manage the lights, electrical outlets, solar devices and a variety of other appliances. The results can be added convenience, freedom from boring chores, a safer home and conservation of energy.

Energy savings are a key feature of a system sold by Hometech Computers, a Brea, California, company whose product controls burglar alarms, lawn sprinklers and clothes washing, among other aspects.

Convenience is a major selling point of the Harris Labs home computer control system. This Marshalltown, Iowa, firm sells a control system that grew out of Laurence Harris' desire to have the lights in his home controlled more efficiently.

Harris first developed a prototype system in 1975, without the aid of microprocessor chips. In January, 1977, he expanded the capabilities of his device by using microprocessors. The first unit was sold in June, 1979.

One of the first units sold is being used in a condominium complex to help operate as a solar collector. In this application, the computer controls a skylight enclosure that retracts when a photosensitive cell detects enough light to begin warming the heat absorbing concrete wall. When the sensor determines night is falling, the skylight will close to help retain heat.

Other operations performed by the computer include an automatic drapery control that operates in the same manner as the skylight, letting light into the home during cool days and keeping the hot sunlight out during the summer.

"The major function of the unit is still primarily for control of lighting and electrical outlets. One owner has the system controlling his heater and air conditioning, but it just turns them on and off. We're still developing a system that will work with devices like thermostats," Harris says.

The lights are turned on and off by small touch sensitive capacitors located around the home like standard light switches. With the computer, the family can control the lights in the usual way, or control all lighting in the home from a central control panel. In addition, different secondary controls can be set up to turn on a bank of lights, such as a kitchen-dining room combination, with a single switch.

The Harris system is designed around several Texas Instruments chips. The central processing unit, the brains of the computer, is a TMS 9900. This 16-bit chip was selected because of its high capabilities, reliability and because it can be interrupted several times per second. The latter feature lets the company eliminate hardware by multiplexing with a vacuum flurorescent display. This 20-character display unit is used in place of a standard terminal and keyboard to trim the cost of the entire system.

Because there is no on-board memory on the 9900 chip, Harris uses four TMS 2516s, providing 4K by 16 bits of UV EPROM, with a capacity of 4096 16-bit words. The operating system, applications software and tables of correspondence are stored in the location.

Because the user does very little programming, there is only 1K byte of read-write memory. If the user wants to change the configuration of lights to be turned off and left on by a master switch, he can alter the erasable, programmable memory. For instance, if the user decides he wants to have light number five of a group remain on at all times, he can change the memory so that when the others are shut off, it will stay on. The user can also change which light will remain on, for example, changing from light number five to light number seven.

In addition to controlling the lights, the Harris system can turn any device on or off by controlling the power to the light socket that the appliance is plugged into. This feature lets the homeowner set the time that his television, coffee maker or any other self-controlling appliance will be turned on and off.

The system manufactured by the Hometech company was originated in 1978 as a home control system. Since the unit,

designed by Bill Mandl, president of the company, is more involved than the Harris system, it costs more.

The basic Hometech computer sells for about $7,000 including sensors and installation. The Harris machine starts at $3,500 for an average home, although the number of touch-sensitive switches and master controls can more than double the price.

With the Hometech system the homeowner can program the computer to turn on the dishwasher when he's out, find out which window has been opened when the burglar alarm rings, cut energy costs and have his lawn watered only when it needs it.

Energy conservation was an important consideration when Mandl designed the system. He claims that up to 50% of the heating and air conditioning costs can be cut with the Hometech computer.

The Hometech unit uses a zone temperature management system that adjusts the temperature in one room by circulating the air from a warmer or cooler room, equalizing the temperatures and saving wear and tear on the heating and cooling elements. The thermostats can be manually controlled, but the computer will monitor these adjustments and won't let the temperature go above or below a level set by the homeowner.

An optional energy saving device is a European import, sun shades. The computer senses the amount of light coming in a window, checks to see whether the house is in a heating or cooling mode, then opens or closes the sun shades as necessary. These heavy wooden louvres will block out most sunlight, keeping the house cool during a hot summer day or helping to retain heat during a cold winter night.

With the sun shades option, the system meets the California tax requirements for a solar device. This makes the owner eligible for a rebate of up to $3,000, nearly half the price of the system.

In areas that have reduced rates tor electricity used during evenings and early morning hours, the timing aspects of the system are important. Using the real time, on-board clock, the user can set his dishwasher or other non-essential devices to operate during these off hours.

Because the Hometech computer requires more user input, it comes with a standard terminal for the input of timing changes, changing maximum and minimum temperatures, deciding how long a clothes dryer should run, etc. By putting RS232 ports in different rooms, the family members can each have terminals for themselves or move one terminal from room to room.

The CPU for this machine is an Intel 8085. Because there is little programming other than setting timers, only 1K of RAM is used. The 15K ROM was not fully utilized in the early models, but it is being used in custom work for those who have special needs.

Because power surges from doorbells and thunderstorms could confuse the computer and make it react as if a command had been entered, the system employs several hardware and software filters. Another safeguard is a self-correcting cycle that corrects problems every 24 hours.

SOFTWARE CONSIDERATIONS

When computerizing for the home environment, one of the major concerns is to get a system that can be operated by any member of the family without a lengthy training period.

To achieve this goal, both of these home computer manufacturers have written their own software using common English programming terms that are known by all family members old enough to operate the systems.

Changing on and off times of the appliances is the most common program alteration on both systems. With the Hometech system, full menus are displayed on the terminal screen, letting the user select the desired segment of the program and telling him how to change it. Because the system is self-prompting, the family members don't have to keep track of papers and manuals after they've read the basic instructions.

To change the timer for a specific function, the user would check the menu and enter the selected area of the program. He would then find out the number of the outlet the device was plugged into. For instance, the coffee maker might be plugged into outlet number 11. The user would then type T11B9AW to get Timer (T) number 11 to Begin (B) at 9 am (A) on Wednesday (W). To have the coffee maker turn off, he would type E in place of B and change the time.

With the Harris system, changing times is a little more difficult because the 20-character screen does not have room for prompts. But the savings over the price of a full terminal are more attractive than a couple of slight inconveniences, according to Harris.

The display screen is controlled by a 16-key keyboard. The user can first press any number to get into the entry mode, referring to his instruction sheet to choose which number he wants. All command numbers must be followed by an asterisk.

The computer first asks for one of five schedule groups, and requests a circuit number after the operator types in his schedule request. The user must then check to see which circuit the desired device is on, then enter that number into the computer. The current timing schedule and any past schedules for that circuit are then displayed chronologically on the screen. The user can then look to see if any of the earlier times are what he wants, or enter the new starting and stopping times into the system.

CONTROLLING THE APPLIANCES

Using the system is centered largely around the specific plug-in to which each appliance is connected. Anything run by timers operates on the simple principle that the appliance is never turned off as long as there's electricity coming through to the appliance.

Since the appliance is not on when there is no electricity, someone could disrupt a person's plans to have coffee ready or to have the TV automatically come on by flipping the manual switch off.

Another potential difficulty may be if a prankster or someone trying to be helpful would switch two plugs. If a coffee maker and a television are plugged in side by side and someone reverses them, the user might be greeted with early morning cartoons rather than by a hot cup of coffee.

While users admit that there is no way to avoid problems caused by mischievous people, they find labeling the important plugs a way of avoiding problems in case an appliance is accidentally unplugged.

The Hometech carries the control of devices a step further by attaching sensors to anything controlled by the computer. For instance, the coffee pot might not be turned on unless the sensor detected water. The lawn would not be watered at the designated time unless a sensor in the ground was dry.

The sensors also work to make an effective burglar alarm. When the magnetic alarm comes on, the computer will turn on any or all lights, sound a horn and dial the police if the system has a modem and recorder. In addition, the terminal will come on and tell the family the location of the illegal entry, allowing them to flee or find the burglar.

REPAIR

Both companies boast low incidence of breakdowns for their systems. Because the computers control many of the home's important functions, like heating and lighting, failure could prove quite costly.

To avoid any large failure, both firms have made their systems modular. This way, if one section of the computer goes down, the other functions will continue to operate. If something does go awry, it can be repaired by simply replacing the card that holds the defective parts.

Because of the danger of having some devices run without human supervision, the manufacturers are careful not to hook the computer up to any devices that could cause a fire or harm anyone.□

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- Includes interface controller board

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CIRCLE INQUIRY NO. 30

Micros Go Shopping

Computerized Supermarket Trims Costs

By Kathy Tekawa, Assistant Editor

Taking a trip to the local supermarket is a traditional habit followed religiously by almost everyone — it's one of those necessities in life that has to be done whether you like it or not.

Those who are short of time find it rather tiresome to push that shopping cart every week, stocking it full of items from A to Z. What's worse is the horrible discovery that you've forgotten your wallet when you're at the cash register with five impatient people behind you.

One unusual facility, Ultra-Market, a computerized grocery store located in Fairfax, Virginia, has developed a new system for its customers, saving them both time and money.

Ultra-Market is the brainchild of 25-year-old Gary Glass, who came up with a quick, inexpensive way for consumers to shop through the use of an Alpha Micro system.

By using the Alpha Micro to keep track of inventory and check customers' orders, costs are kept to a minimum — consumers save about 5% to 15% from the conventional grocery store, according to Glass. While the system is not unlike the large chain store computers that read the Universal Product Codes for pricing, Glass' supermarket is unusual because it operates as a membership store, using a smaller, less expensive microcomputer to handle most functions of the business.

The shoppers in this suburb near Washington, D.C., phone in their orders to Ultra-Market rather than walking down those aisles of packaged calories themselves.

How does this kind of store operate? To begin with, each customer has a membership number which is given to the

operator, who immediately programs it into the terminal. The customer's record is then displayed on a screen so the operator can see if the caller has written a bad check, if it is his first time using the service and other statistical information.

The operator then asks if the shopper will pick up his order or if he wants it delivered. Then the computer will run through a scheduling algorithm which shows the next time the order can be delivered or picked up. Next, the customer places his order by using the store's catalog which lists each item by number.

After the customer has finished ordering, the computer will check to see if any of the desired articles are out-of-stock, discontinued or have price changes. Finally, the total of the bill is given to the shopper and the groceries are usually ready to be picked up within two hours. It takes longer for purchases to be delivered, a service which is given to those who have orders over $20.

Once the system has completed dealing with the customer, a picking slip is printed for the warehouse worker. He then picks up items according to the way the printed slip has shown him. This way the employee can quickly walk up one aisle and down the next, knowing exactly where he should obtain each item.

According to Tom Heft, who custom designed the software and is Vice President of General Data, Inc., "One of the biggest reasons Gary is able to supply a grocery service like this is he can have his workers pick items from the shelf much faster than the shoppers could."

One feature added to the system after Glass experienced some problems with goods being out-of-stock is a substitution system. "Now when something is out-of-stock, a chain link allows other items to show up on the screen to give the customer a choice of similar items. For example, if a customer wants Campbell's soup and it's out, then the computer will show three other types of soups he can choose from," explains Heft.

Keeping track of personnel at Ultra-Market is also computerized. Rather than having a manager who is constantly concerned over the productivity of his employees, the computer is able to generate much more precise information.

"Each employee is logged into the system and we are able to see, for example, who took the customer's order and how long it took, who picked the items from the shelf and how efficiently it was done. So, we have complete control from beginning to end," Heft says, "then when we have the production analysis report we are able to see right away which people are doing their jobs and which ones are making constant mistakes."

In the future, according to Glass, the system will also be used for verification of orders, accounting and bookkeeping purposes. "We are holding off on the non-critical parts because the expense of designing the software is so great," Heft explains. He worked almost non-stop for 15 days to complete the major portion of the software.

The Alpha Micro computer is a complete on-line order-entry system which uses a control data disk drive. The 16-bit unit is one of the more powerful microcomputers. It has 96K of memory available, which is far more sufficient than what is actually needed, Glass says.

In discussing the possibilities of home computerists using modems to link their computers to Ultra-Market, Glass says he doesn't think he will allow it. "A demand does exist by home computerists in the area, but I don't believe we'll permit them to tie into our system because of security reasons and the expense of allowing someone to tie up our line. Our computer's main purpose is to process orders."

According to a case study conducted by a graduate professor at the Universtiy of Virginia, Ultra-Market is a positive step towards the future of retailing. "Because we are entering the electronic age, I believe something similar to Ultra-Market will have to be the future of retailing," Glass says.

Glass also foresees other ways shopping may be done in the future. "It is not unrealistic that in the next 6 to 10 years consumers may shop not by catalog, but through a video screen on their television sets or perhaps through a computerized phone with a viewer on it."

Glass partly bases his views on research conducted with newspapers being put on videoscreens. "By doing this with newspapers it is possible to instantly update news and curtail costs because you're not paying for paper, printing costs, etc." The name of the game is savings, according to Glass; how the most effective, efficient way consumers can save will be how the store of the future will operate.

The computer center and warehouse, which has been in business since July 1978, covers a 5,000-square-foot area that is stocked with a plentiful supply of frozen and name-brand or private labeled goods. No fresh meats, produce or dairy products are offered due to the possibility of spoilage.

Since customers are not allowed inside the warehouse there's no need for spacious aisles and expensive signs. More savings factors are the elimination of shoplifting and the low number of bad checks received.

"When you can substantially reduce overhead then you are able to offer savings to the consumer, but the main benefit is time. People don't have to take time to go shopping, but they can place orders from home, work or wherever they happen to be," Glass explains.

The only requirement of becoming a member at Ultra-Market is a $10 membership fee. Once a member joins, a catalog of the store's inventory is sent every two or three months.

The members of Ultra-Market have heard of the store strictly by word-of-mouth since Glass does not advertise. The response has been tremendous, according to Glass, although he is not yet allowed to discuss the finances of his store. "The demand is so intense right now we are having a difficult time handling it," he claims.

Glass came up with the idea of the computerized store four years ago while attending Northern Virginia Community College. He was also working at a Safeway Supermarket.

After conceiving his idea of a computer-run store, Glass and two other partners hit the street and sold some 20 stocks. The results of his idea have been incredible.

The whole idea of a computer monitoring control and managing inventory is not radically different at all, according to Glass. "This is something people have done for ten years. The only difference is I've used it in a retail market rather than a wholesale market or any other kind of business," the young businessman explains.

When first starting his unique store, the biggest fear Glass had was if people would accept a computer system in a catalog supermarket situation. "We didn't have to worry if a computer was capable of doing the job because we knew it would. What we did worry about was people's response."

It came as a surprise to Glass when he and his partners heard nothing but positive responses. He remembered five years ago when the word "computer" had such negative connotations, and was uncertain if consumers were ready for such a big change from the conventional supermarkets.

Glass attributes Ultra-Market's success to today's economy and the timing he had in opening a business which allows consumers to save. "I don't know if we tried doing this during a time when the economy was stable if it would work," he says. "We're in such a negative economy right now that we have to think of all kinds of ways to save money. I've always heard that the only way to do it would be to automate and decrease operating expenses and that's just what a computer does."

Glass reflects back when the self-serve supermarket came into being and the changes which occurred. "If you go back in history you'll see that changes always occurred when we were in a negative economy," he states. "Back in the early 1900's when everyone shopped at the General Store, the clerk got all the items for you. But when the depression hit, people realized you could save a little money if you got the items from the shelves yourself. Ultra-Market is the same type of thing, but with computers. Although habits are hard to break, people are accepting and liking it. In fact," he says enthusiastically, "they're actually excited about the whole idea."□

AMS: A Record Management System

By Dr. Rinaldo F. Prisco

The coordination of the advisement of Mathematics majors for the State University of New York, College at Oswego, involves about two hundred students, seven math related programs, thirty-five math courses, and twenty math advisors. Students enter programs, leave programs, change courses and change programs fairly frequently. Handling all these records led to the development of the program AMS which is discussed in this article.

Sample 1.

	NAME	RECORD #	ADVISOR #
1)	Mobius, A.	1	15
2)	Sylvester, J.	2	16
3)	Russell, B.	3	16
4)	Zermelo, E.	4	15
5)	Boole, G.	5	17
6)	Cayley, A.	6	15
7)	Dirichlet, P.	7	20
8)	Galois, E.	8	15
9)	Hardy, G.	9	16
10)	Lobachewsky, N.	10	17
11)	Kronecker, L.	11	5
12)	Pascal, B.	12	16
13)	Poincare, H.	13	15
14)	Descartes, R.	14	15
15)	Reimann, G.	15	16

Unsorted List

	NAME	RECORD #	ADVISOR #
1)	Boole, G.	5	17
2)	Cayley, A.	6	15
3)	Descartes, R.	14	15
4)	Dirichlet, P.	7	20
5)	Galois, E.	8	15
6)	Hardy, G.	9	16
7)	Kronecker, L.	11	5
8)	Lobachewsky, N.	10	17
9)	Mobius, A.	1	15
10)	Pascal, B.	12	16
11)	Poincare, H.	13	15
12)	Reimann, G.	15	16
13)	Russell, B.	3	16
14)	Sylvester, J.	2	16
15)	Zermelo, E.	4	15

List #1

	NAME	RECORD #	ADVISOR #
1)	Kronecker, L.	11	5
2)	Cayley, A.	6	15
3)	Descartes, R.	14	15
4)	Galois, E.	8	15
5)	Mobius, A.	1	15
6)	Poincare, H.	13	15
7)	Zermelo, E.	4	15
8)	Hardy, G.	9	16
9)	Pascal, B.	12	16
10)	Reimann, G.	15	16
11)	Russell, B.	3	16
12)	Sylvester, J.	2	16
13)	Boole, G.	5	17
14)	Lobachewsky, N.	10	17
15)	Dirichlet, P.	7	20

List #2

Although AMS deals specifically with students, courses, math programs and advisors, it is analogous to dealing with salespersons, sales, products and sales managers, as well as patients, ailments, treatments and physicians.

At this time AMS is being run on a system consisting of a 32K Sol/20, a single-drive North Star minifloppy disk system (single density), and a Selectra-Print printer. In addition to the 32K RAM, the Sol/20 has 1K RAM used by its monitor as a scratchpad which is available for machine language subroutines and data storage.

Design constraints imposed on AMS were: (1) minimum disk motor activation, (2) easily updated records, and (3) efficient disk storage of the data. Consequently AMS contains some features seldom seen in routine programs but which are nonetheless quite suitable for many applications. These features include: linked lists, a shell-Metzner sort on two fields (one of which involves a composite order relation), bit packing of data, the North Star INCHAR$ function, and the use of non-BASIC RAM to store list pointers.

AMS produces two lists. List 1 of Sample 1 is a student-advisor directory; students are listed in alphabetical order together with the code numbers of their advisors. List 2 of Sample 1 is in lexicographic order where names are first grouped by advisor code and then listed alphabetically.

The lexicographic ordering of List 2 is used by AMS to prepare the individual lists of students assigned to each advisor. An advisor's list consists of an alphabetical listing of the students assigned to the advisor together with their math records (see Sample 2).

Sample 2.

Dr. R. F. Prisco Rm. 212 Ext. 3074

Cayley, A.	80	B. A.	110B 220B 230A 190A 240C 347B 375A 447B 335A 354B 366A 463B
Descartes, R.	82	B. S.	110A 190B 220A 230A
Galois, E.	83	Minor	110B
Mobius, A.	81	S. Ed.	110B 220C 190B 335A 371B
Poincare, H.	82	A.M.E.	110A 220B 230A 310A
Zermelo, E.	81	E. Ed.	110A 158B 190A 230C

RECORD STORAGE

Depending on the Math Program, a student might have to take up to fifteen math courses, most specified, some under advisement. Courses are numbered from 100 to 499. There are six possible grade entries: ?, A, B, C, D, and E ("?" is used to signify that the grade is yet to be determined). There are 35 math courses in one program or another. How do we store course-grades? If we use 4-character strings for each of them, we use 60 bytes per record, 12K bytes for 200 records. AMS is much more efficient: one byte per course-grade, 3K bytes for 200 records.

Since there are 35 courses and 6 grade entries, there are 210 possible course-grades. An 8-bit byte can contain any integer value from 0 to 256. Thus the method used is to en-

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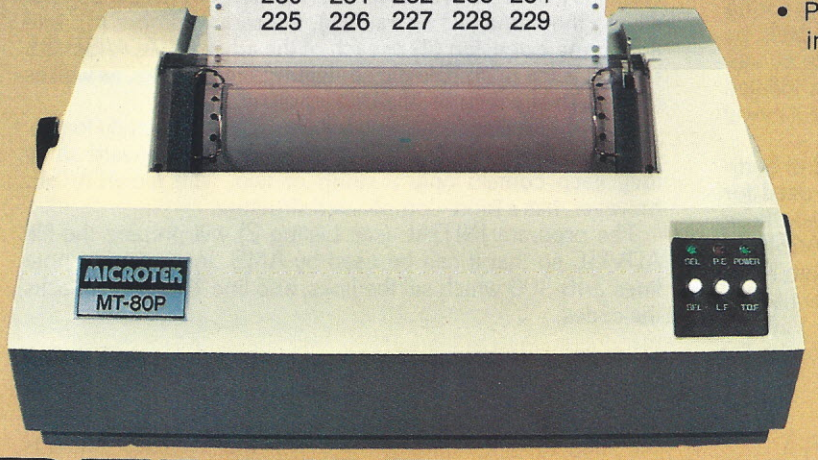

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code each of the 210 possible course-grades into one byte. A list of the course numbers and a little mod 6 arithmetic will do it (see Table 1).

Table 1.

COURSE #	?	E	D	C	B	A
110	1	2	3	4	5	6
158	7	8	9	10	11	12
190	13	14	15	16	17	18
220	19	20	21	22	23	24
230	25	26	27	28	29	30
240	31	32	33	34	35	36
278	37	38	39	40	41	42
310	43	44	45	46	47	48
326	49	50	51	52	53	54
327	55	56	57	58	59	60
335	61	62	63	64	65	66
337	67	68	69	70	71	72
342	73	74	75	76	77	78
347	79	80	81	82	83	84
348	85	86	87	88	89	90
354	91	92	93	94	95	96
366	97	98	99	100	101	102
370	103	104	105	106	107	108
371	109	110	111	112	113	114
373	115	116	117	118	119	120
375	121	122	123	124	125	126
390	127	128	129	130	131	132
409	133	134	135	136	137	138
410	139	140	141	142	143	144
426	145	146	147	148	149	150
427	151	152	153	154	155	156
447	157	158	159	160	161	162
448	163	164	165	166	167	168
454	169	170	171	172	173	174
463	175	176	177	178	179	180
464	181	182	183	184	185	186
475	187	188	189	190	191	192
478	193	194	195	196	197	198
490	199	200	201	202	203	204
499	205	206	207	208	209	210

AMS uses bit packing to store the status code S (0 = freshman, ..., 3 = senior) in 2 bits, the program code P in 3 bits, and the advisor code A in 5 bits. The total space AMS uses for 200 students' records is an easily manageable 3400 bytes.

LINKED LISTS

Linked lists are used because they enable multiple listing functions with files easily updated. Space made available by students deleted from a file can be used immediately by students added to the file. There is no need to use an inflated file, provide a file compactification routine, or rewrite a newly sorted file to disk.

Three sets of links are used by AMS. Lists 1 and 2 of Sample 1 each require a set of links. The third set is used for keeping track of the available record space. On disk these links occupy the first 603 bytes of the data file ADVISE. In RAM they occupy the 603 bytes in the Sol/20 system RAM addressable at 51456 (freeing 2K BASIC RAM for other uses).

The links are used to set the position vector P( ) where P(I) is the true position (record #) of the Ith entry of the list being accessed.

The links for Lists 1 and 2 are:

5, 12, 4, 2, 0, 6, 14, 8, 9, 11, 1, 10, 13, 15, 7, 3.

and

11, 13, 5, 2, 9, 10, 14, 0, 1, 12, 7, 6, 15, 4, 8, 3.

SORTING ROUTINE

Sorts are done for each type of list. The sorts only affect the links; the records themselves are never reordered. The sequence used in sorting is: (1) set the position vector P( ) for the list being sorted, (2) compare list entries accessed by P( ), (3) change corresponding components of P( ) if necessary, and (4) at the completion of the sort, use P( ) to set the new link sequence. The sort for List 1 is a simple alphabetical sort. The lexicographic sort for List 2 is a little more involved.

When comparing two student entries, AMS first checks the advisor code. If one code is less than another, then the components of P( ) are changed accordingly; if the advisor codes are the same, then the students' names are compared alphabetically and the components of P( ) are changed accordingly.

SAVING ON DISK

Once the records are read from the data file ADVISE, AMS can run for hours without activation of the disk drive. During any routine that affects the records, flags are set to indicate which records have been modified. When <LOAD> or control-J is used to request that the disk be updated, the links are saved and the flag string P2$( ) is checked for each record entry, saving those with flags set (using random access).

HOUSEKEEPING ROUTINES

The course, grade and name update routines of AMS are quite extensive, making good use of Sol's fast VDM. Direct access to a record is via the absolute position of the record, providing rapid record modifications independent of listing types.

The routines to add or drop students from the lists are interesting because of the required manipulation of the links that they perform. When adding a new student to the file, the position of the student on each list may be specified so as to avoid an unnecessary sort.

INCHAR$ FUNCTION

Whenever input of a single character is required (such as menu choices), the North Star INCHAR$ function is used. This function, when called, will wait for the input of a single character; it does not require a <RETURN>, nor will it echo the character to the screen. Since it does not require the <RETURN>, the effect of the choice is immediate.

This function is also useful for entering control characters which the North Star INPUT statement will not accept. The Sol/20 has many special keys that can now be used to perform special functions.

DATA FILES

AMS uses data from three files. The file COURSES contains strings of math courses and programs. The file STAFF contains a string of 400 characters in fields of length 20 specifying the name (13 characters), the room number (3), and the phone extension (4) of each of the advisors. ADVISE (35 blocks) is the main data file containing the list links, as well as the names and records of all the advisees.

Once these files have been initialized, AMS is ready to run. The files COURSES and STAFF are straightforward since they each contain only a string or two. The file ADVISE, however, has a more complicated structure.

The program INITIAL (see Listing 2) will prepare the file ADVISE so that it can be used by AMS. In particular, note lines 240-300 which set the links, and line 190 which packs the codes.

VARIATIONS

Although AMS is highly specialized, many of its features can be used in other programs. The program itself can be modified to other management systems. Replace students with salespersons, advisors with district managers, math programs with company products, and grades with sales. With a few additional modifications, AMS can become a sales management system.

In one way or another, record management systems all have similar characteristics. Specific details may differ, but generally the differences are superficial.□

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Variable List

VARIABLE	VALUE	DIM	LINE #
A	Advisor Code*	1	270
A$	All Names String	4000	230
C	Course-grade Code	1	1220
C$	All Status Code String	400	230
C1$	Course List String	105	60
D$	Grade string of zeros	15	100
F$	Faculty String	400	70
G$	All Grades String	3000	240
G1$	?EDCBA	6	90
I,J	Indexes*	1	770
K	Data Holder*	1	110
L	Length*	1	610
M	Disk/RAM Pointer	1	110
M$	Course-grade String	4	1315
N$	Name String	20	170
N1,N2	Status Codes	1	170
O$	Menu String	7	90
P	Port/Program Code*	1	510
P$	Math Programs String	64	60
P( )	Record #	200	270
P2$	Disk Flag String	200	1460
Q	Index*	1	280
R$	Grade String	15	220
S	Status Code*	1	550
U	Advisor Code	1	860
X	System RAM Address	1	90

*general variable; most common value listed.

Routine List and Program Commentary

Line #'s	Routine/Function	Comments
20-240	Read & set all vars	note routines 200, 210, 220
250-280	Set P( )	input A, the list type
290-310	FNP(X,Y)	Returns RAM address
320	FNA$(I)	Returns Ith name
330-410	Prints Menu	
420	Command prompt	====>
430-470	Process command	note INCHAR$ function
480-700	Print advisor lists	570 rings bell 10 times
710-950	Sort	both lists; A is flag
960-1080	Print Lists #1,2	950 sets P( )
1090-1540	Grade routines	1140-1170 menu & prompt >>>
1550-1730	New records	1670 sets link & flags
1740-1820	Delete record	1790, 1810 set links
1860-1980	Disk update	1940 checks flag
1990-2120	Change name/codes	2110 sets flag for disk
2130	Input routine	

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CIRCLE INQUIRY NO. 34

LISTING 1

```
1  REM                AMS
2  REM
3  REM          Rinaldo F. Prisco
4  REM          Mathematics Dept.
5  REM       SUNY, College at Oswego
6  REM          Oswego, NY 13126
7  REM
20 FOR I=51456 TO 52058:FILL I,0:NEXT
30 DIM C1$(105),G1$(6),M$(4),O$(7),N$(20),A$(4000)
40 DIM G$(3000),R$(15),C$(400),F$(400),P2$(200)
50 DIM S$(20),B$(20),P(200),D$(15),J(2),P$(64)
60 OPEN #0,"COURSES":READ #0,C1$,P$:CLOSE #0
70 OPEN #0,"STAFF":READ #0,F$:CLOSE #0
80 OPEN #0,"ADVISE":READ #0 %8950,&N
90 O$="ASLGNDC":G1$="?EDCBA":X=51456
100 D$="":FOR I=1 TO 15:D$=D$+CHR$(0):NEXT
110 M=0:READ #0 %0,&K:FILL X,K
120 FOR I=1 TO N:GOSUB 210:NEXT
130 M=201:GOSUB 200
140 FOR I=1 TO 200:GOSUB 210:NEXT
150 M=402:GOSUB 200
160 FOR I=1 TO N:GOSUB 210:NEXT
170 M=603:I=0:READ #0 %M,N$,&N1,&N2,R$:GOSUB 230
180 FOR I=1 TO N-1:GOSUB 220:NEXT
190 CLOSE #0:GOTO 330
200 READ #0 %M,&K:FILL X+M,K:RETURN
210 READ #0,&K:FILL X+M+I,K:RETURN
220 READ #0,N$,&N1,&N2,R$
230 A$(20*I+1)=N$:C$(2*I+1)=CHR$(N1):C$(2*I+2)=CHR$(N2)
240 G$(I*15+1)=R$:RETURN
250 REM - SET P -
260 Q=0:M=0
270 M=M+1:Q=EXAM(FNP(A,Q)):P(M)=Q
280 IF Q=0 THEN RETURN:GOTO 270
290 DEF FNP(X,Y)
300 X=(X=0)*51456+(X=1)*51657+(X=2)*51858
310 RETURN X+Y:FNEND
320 DEF FNA$(X)=A$(20*(X-1)+1,20*X)
330 !CHR$(11)
340 !TAB(18),"A         PRINT ADVISOR LISTS"
350 !TAB(18),"S         SORT"
360 !TAB(18),"L         LISTS #1,2"
370 !TAB(18),"G         GRADE ROUTINES"
380 !TAB(18),"N         NEW RECORD"
390 !TAB(18),"D         DELETE RECORD"
400 !TAB(18),"C         CHANGE NAME OR CODES":!
410 !:!TAB(14),"<LOAD>=SAVE"
420 !:!"====>  ",:Z$=INCHAR$(0):!"OK"
430 FOR I=1 TO 7:IF O$(I,I)=Z$ THEN EXIT 470:NEXT
440 IF ASC(Z$)=13 OR ASC(Z$)=7 THEN 330
450 IF ASC(Z$)=12 THEN 1860
460 !Z$:GOTO 420
470 ON I GOTO 480,710,960,1090,1550,1740,1990
480 REM - ADVISOR LISTS -
490 LINE #2,100
500 !"SELECTRIC? ",:GOSUB 2130
510 IF Z$="Y" THEN P=2 ELSE P=0
520 Q=0:B=0
530 Q=EXAM(FNP(2,Q)):IF Q=0 THEN 700
540 N1=ASC(C$(2*(Q-1)+1)):N2=ASC(C$(2*Q))
550 A=INT(N1/2^3):K=N1-A*2^3:S=INT(N2/2^6)
560 IF A=B THEN 640
570 FOR I=1 TO 10:!#P,CHR$(7),:NEXT :!#P
580 INPUT "<RETURN> WHEN READY. ",Z$
590 B=A
600 N$=F$(20*(B-1)+1,20 *B)
610 FOR L=13 TO 1 STEP -1:IF N$(L,L)<>" " THEN EXIT 620:NEXT
620 !#P,TAB(10),"Dr. ",N$(1,L),"   Rm. ",N$(14,16),
630 !#P,"   Ext. ",N$(17)
635 !#P,TAB(9),:FOR I=1 TO L+28:!#P,"=",:NEXT I:!#P:!#P:!#P
640 !#P,FNA$(Q),83-S,"  ",P$(K*8+1,K*8+8),
650 R$=G$(15*(Q-1)+1,15*Q)
660 FOR I=1 TO 15:C=ASC(R$(I)):IF C=0 THEN EXIT 690
665 IF INT(I/6)*6<>I THEN 670:!#P:!#P,TAB(33),
670 M=INT(C/6):R=C-M*6:IF R>0 THEN 680:M=M-1:R=6
680 !#P,C1$(3*M+1,3*M+3),G1$(R,R)," ",
685 NEXT I
690 !#P:!#P:GOTO 530
700 P=0:LINE #2,72:GOTO 420
710 REM - SORT -
720 A=0
730 GOSUB 250:K=M-1
740 REM - BEGIN SORT -
750 N1=K:M=N1
760 M=INT(M/2):IF M=0 THEN 910
770 J=1:K=N1-M
780 I=J
790 L=I+M
800 IF A=2 THEN 840
810 B$=FNA$(P(I))
820 N$=FNA$(P(L))
830 IF B$<N$ THEN 900 ELSE 880
840 U=ASC(C$(2*(P(I)-1)+1)):U=INT(U/2^3)
850 N2=ASC(C$(2*(P(L)-1)+1)):N2=INT(N2/2^3)
860 IF U<N2 THEN 900:IF U>N2 THEN 880
870 IF FNA$(P(I))<FNA$(P(L) ) THEN 900
880 Z=P(I):P(I)=P(L):P(L)=Z
890 I=I-M:IF I<1 THEN 900 ELSE 790
900 J=J+1:IF J>K THEN 760 ELSE 780
910 REM - END SORT -
920 K=1:J=0
930 FILL FNP(A,J),P(K):IF P(K)=0 THEN 950
```

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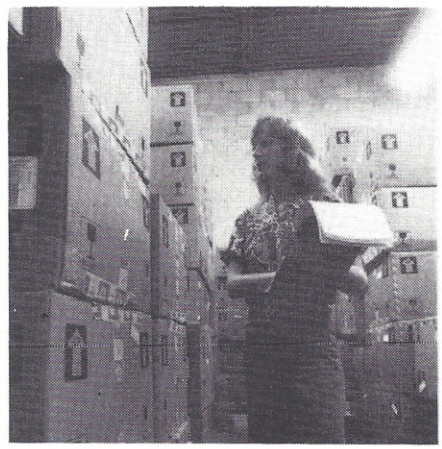

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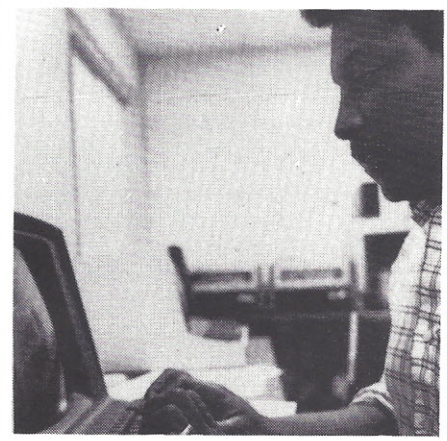

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CURRENT ASSETS			
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Marketable Securities	161,000		
Accounts Receivable	71,367		
Fees Earned But Not Billed	41,900		
Prepaid Expenses	6,265		
		324,587	
FIXED ASSETS			
Office Furniture	15,739		
Leasehold Improvements	23,500		
Computer	11,063		
		58,301	
INTANGIBLE ASSETS			
Patents	13,872		
		13,872	
Total ASSETS			396,760
LIABILITIES AND CAPITAL			
LIABILITIES			
CURRENT LIABILITIES			
Current Part of Long Term Debt	5,000		
Accrued Payroll	9,242		
Income Taxes Payable	15,660		
Trade Payables	24,569		
Accrued Liabilities	962		
		58,433	
LONG TERM LIABILITIES			
Note Payable (Less Current)	20,250		
Retirement Benefits	51,312		
		71,562	
Total LIABILITIES			129,995
STOCKHOLDER'S EQUITY			
CAPITAL STOCK			
Common Stock $100, 1000 issued	100,000		
Paid in Surplus	100		
Preferred Stock $25, 800 iss.	20,000		
		120,100	
RETAINED EARNINGS			
Retained Earnings, Beginning	21,091		
Net Income Brought Forward	119,574		
		140,665	
Total STOCKHOLDER'S EQUITY			260,765
TOTAL LIABILITIES AND CAPITAL			390,760

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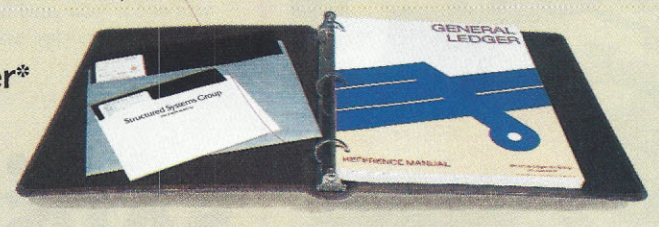

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```
940 J=P(K):K=K+1:GOTO 930
950 IF A=2 THEN 420:A=2:GOTO 730
960 REM - LISTS #1,2 -
970 !"SELECTRIC? ",:GOSUB 2130
980 IF Z$="Y" THEN P=2 ELSE P=0
990 !"List #1 or List #2? ",:GOSUB 2130:A=VAL(Z$)
995 IF A<>2 THEN A=0:GOSUB 250
1000 !#P,TAB(10),"NAME",TAB(26),
1010 !#P,"RECORD #",TAB(37),"ADVISOR #"
1020 FOR I=1 TO 48:!#P,"=",:NEXT:!#P:M=0
1030 M=M+1:Q=P(M):IF Q>0 THEN 1040:P=0:GOTO 420
1040 IF P=2 OR M>INT(M/16)*16 THEN 1060:INPUT "<RETURN>",Z$
1050 !CHR$(23),
1060 !#P,%3I,M,")  ",FNA$(Q),
1070 !#P,%4I,Q,TAB(37),
1080 Q=ASC(C$(2*(Q-1)+1)):!#P,%5I,INT(Q/2^3):GOTO 1030
1090 REM - GRADES -
1100 !CHR$(11),TAB(20),"***GRADE ROUTINES***":!:!
1110 INPUT "Enter Record #: ",S:!:P=0
1120 N$=FNA$(S):R$=G$(15*(S-1)+1,15*S)
1130 GOSUB 1480
1140 !:!:!TAB(12),"C=CHANGE GRADE, E=ENTER NEW GRADE"
1150 !TAB(12),"D=DELETE GRADE, N=NEW STUDENT"
1160 !:!TAB(17),"<MODE>=MAIN ROUTINE":!:!
1170 !">>> ",:Z$=INCHAR$(0):!"OK":IF ASC(Z$)>7 THEN 1190
1180 GOSUB 1460:GOTO 420
1190 IF Z$="C" THEN 1220:IF Z$="E" THEN 1310
1200 IF Z$="D" THEN 1390:IF Z$="N" THEN 1450
1210 !CHR$(11),N$:!:GOTO 1140
1220 INPUT "WHICH ONE? ",Z:C=ASC(R$(Z))
1230 Q=INT(C/6):R=C-Q*6
1240 IF R>0 THEN 1250: Q=Q-1:R=6
1250 !C1$(3*Q+1,3*Q+3),G1$(R,R)
1260 !"ENTER NEW GRADE FOR MATH ",C1$(3*Q+1,3*Q+3),": ",
1270 GOSUB 2130
1280 FOR R=1 TO 6:IF Z$=G1$( R,R) THEN EXIT 1300:NEXT
1290 !"ONLY GRADES: ",G1$,".":GOTO 1260
1300 K=6*Q+R:R$(Z,Z)=CHR$(K):GOTO 1130
1310 !"ENTER COURSEGRADE: ",
1315 M$="":FOR I=1 TO 4:Z$=INCHAR$(0):M$=M$+Z$:!Z$,:NEXT I:!
1320 FOR I=0 TO 34:IF C1$(I*3+1,I*3+3)=M$(1,3) THEN EXIT 1340
1330 NEXT:!"THERE IS NO SUCH COURSE.":GOTO 1310
1340 FOR J=1 TO 6:IF G1$(J,J)=M$(4,4) THEN EXIT 1350:NEXT:J=1
1350 K=6*I+J
1360 FOR I=1 TO 15:IF ASC(R$(I,I))=0 THEN EXIT 1380:NEXT
1370 !"QUOTA FILLED.":GOTO 1130
1380 R$(I,I)=CHR$(K):GOTO 1130
1390 GOSUB 1480
1400 INPUT "ENTER # OF GRADE TO BE DELETED: ",Z
1410 IF Z=1 OR Z=15 THEN 1430:R$=R$(1,Z-1)+R$(Z+1,15)+CHR$(0)
1420 GOTO 1130
1430 IF Z=15 THEN 1440:R$=R$(2)+CHR$(0):GOTO 1130
1440 R$=R$(1,14)+CHR$(0):GOTO 1130
1450 GOSUB 1460:GOTO 1100
1460 P2$(S)=CHR$(1)
1470 G$(15*(S-1)+1)=R$:P2$(S)=CHR$(1):RETURN
1480 !#P,CHR$(11),S,")  ",N$:!#P:!#P
1490 !#P,TAB(10),:FOR I=1 TO 15:C=ASC(R$(I))
1495 IF C=0 THEN EXIT 1540
1500 Q=INT(C/6):R=C-Q*6:IF R>0 THEN 1510:Q=Q-1:R=6
1510 !#P,%2I,I,")  ",C1$(3*Q+1,3*Q+3),G1$(R,R),"  ",
1520 IF I<>INT(I/5)*5 THEN 1530:!#P:!#P,TAB(10),
1530 NEXT
1540 IF I>1 THEN !#P:!#P:RETURN
1550 REM - NEW RECORD -
1560 N$=S$:INPUT "NAME: ",N$(1)
1570 INPUT "ADVISOR CODE: ",A
1580 IF A<32 THEN 1590:!"TOO LARGE.":GOTO 1570
1590 !"STATUS CODE: ",:GOSUB 2130:S=VAL(Z$)
1600 IF S<4 THEN 1610:!"TOO LARGE":GOTO 1590
1610 !"PROGRAM CODE: ",:GOSUB 2130:Z=VAL(Z$)
1620 IF Z<8 THEN 1630:!"TOO LARGE":GOTO 1610
1630 N1=A*2^3+Z:N2=S*2^6
1640 INPUT "Record # of preceeding name on List #1? ",J(0)
1650 INPUT "Record # of preceeding name on List #2? ",J(2)
1660 S=EXAM(FNP(1,0)):IF S>0 THEN 1670:!"FILE FULL":RETURN
1670 FILL FNP(1,0),EXAM(FNP(1,S)):P2$(S)=CHR$(1)
1680 IF S>N THEN N=S
1690 A$((S-1)*20+1)=N$:G$((S-1)*15+1)=D$
1700 C$(2*(S-1)+1)=CHR$(N1):C$(2*S)=CHR$(N2)
1710 A=0:GOSUB 1720:A=2:GOSUB 1720:GOTO 420
1720 GOSUB 250:J=J(A):K=P(J):L=P(J+1)
1730 FILL FNP(A,K),S:FI LL FNP(A,S),L:RETURN
1740 REM - DELETE RECORD -
1750 INPUT "Which record # is to be deleted? ",P
1760 FOR A=0 TO 2 STEP 2
1770 GOSUB 250
1780 FOR J=1 TO M:IF P(J)=P THEN EXIT 1790:NEXT J
1790 I=P(J-1):K=P(J+1):FILL FNP(A,I),K
1800 NEXT A
1810 K=EXAM(FNP(1,0)):FILL FNP (1,0),P:FILL FNP(1,P),K
1820 !:!FNA$(P)," deleted.":GOTO 420
1860 REM - DISK UPDATE -
1870 OPEN #0,"ADVISE"
1880 FOR A=0 TO 2:X=(A=1)*201+(A=2)*402
1890 WRITE #0 %X,&EXAM(FNP(A,0))
1900 FOR J=1 TO N-(A=1)
1910 WRITE #0,&EXAM(FNP(A,J)),NOENDMARK
1920 NEXT:NEXT
1930 FOR I=1 TO N
1940 IF ASC(P2$(I))=32 THEN 1980
1950 N1=ASC(C$(2*(I-1)+1)):N2=ASC(C$(2*I))
1960 R$=G$(15*(I-1)+1,15*I)
1970 WRITE #0 %603+(I-1)*41,FNA$(I),&N1,&N2,R$,NOENDMARK
1980 NEXT:WRITE #0 %8950,&N:CLOSE #0:GOTO 420
1990 REM - CHANGE NAME OR CODES -
```

```
1995 Y$="APSN"
2000 INPUT "Enter Record #: ",Q:N$=FNA$(Q)
2010 N1=ASC(C$(2*(Q-1)+1)):N2=ASC(C$(2*Q))
2020 A=INT(N1/2^3):K=N1-A*2^3:S=INT(N2/2^6)
2025 GOSUB 2120
2030 !:! "WHICH ONE? (A=A, P=P, S=S, N=N$, M=MAIN ROUTINE) ",
2040 GOSUB 2130
2045 FOR Z=1 TO 4:IF Z$=Y$(Z,Z) THEN EXIT 2050:NEXT Z
2050 !"NEW ",:ON Z GOTO 2060,2070,2080,2090,330
2060 INPUT "A-CODE: ",A:GOTO 2100
2070 !"P-CODE: ",:GOSUB 2130:K=VAL(Z$):GOTO 2100
2080 !"S-CODE: ",:GOSUB 2130:S=VAL(Z$):GOTO 2100
2090 N$=S$:INPUT "NAME: ",N$(1):A$(20*(Q-1)+1)=N$
2100 C$(2*(Q-1)+1)=CHR$(A*2^3+K):C$(2*Q)=CHR$(S*2^6)
2110 P2$(Q)=CHR$(1):GOTO 2025
2120 !CHR$(11),N$:!"A-CODE:",A:!"P-CODE:",K:!"S-CODE:",S:RETURN
2130 Z$=INCHAR$(0):!Z$:RETURN
```

LISTING 2

```
10  REM          INITIAL
20  REM
30  REM            Rinaldo F. Prisco
40  REM
50  REM  This program will structure the file
60  REM  ADVISE prior to its first use by AMS.
70  REM
100 DIM N$(20),S$(20),A$(4000),C(400),G$(15)
110 N=1
120 INPUT "ENTER NAME: ",N$(1)
125 IF N$(1,3)="END" THEN 210
130 INPUT "ENTER ADVISOR CODE: ",A
140 IF A<32 THEN 150:!"TOO LARGE.":GOTO 130
150 INPUT "ENTER STATUS CODE: ",S
160 IF S<4 THEN 170:!"TOO LARGE.":GOTO 150
170 INPUT "ENTER PROGRAM CODE: ",P
180 IF P<8 THEN 190:!"TOO LARGE.":GOTO 170
190 C((N-1)*2+1)=A*2^3+P:C(N*2)=S*2^6
200 A$((N-1)*20+1)=N$:N$=S$:N=N+1:GOTO 120
210 N=N-1
220 G$="":FOR I=1 TO 15:G$=G$+CHR$(0):NEXT
230 OPEN #0,"ADVISE"
240 FOR I=1 TO 602:WRITE #0,&0,NOENDMARK:NEXT I
250 WRITE #0 %0,&1
260 FOR J=2 TO N:WRITE #0,&J,NOENDMARK:NEXT
270 WRITE #0 %402,&1
280 FOR J=2 TO N:WRITE #0,&J,NOENDMARK:NEXT
290 WRITE #0 %201,&N+1
300 FOR J=2 TO 200:WRITE #0,&J,NOENDMARK:NEXT
310 WRITE #0 %603,A$(1,20),&C(1),&C(2),G$
320 FOR J=1 TO N-1:WRITE #0,A$(J*20+1,J*20+20)
330 WRITE #0,&C(J*2+1),&C(J*2+2),G$,NOENDMARK:NEXT
340 WRITE #0 %8950,&N:CLOSE #0
```

More Mileage from Your Text Editor

By Bill Roch

A good text editor is a real time saver when creating and maintaining data files. When most individuals think of a text editor, they think in terms of writing letters.

This article describes a few ways a text editor can be used to reduce or eliminate programming and still get satisfactory results. When used properly, it can be a real aid in getting a job done quickly.

For the purposes of this article, a text editor should be able to:

- Add and delete records.
- Change characters within a record.
- Add and delete characters within a record.
- Search through one or more records for matching strings and replace one or more characters with new characters.
- Create data files that can be read by a program.
- List single, selected or a range of records.

Optionally it may be handy to:

- Move one or more records to a new location in the file.
- Duplicate or copy one or more records leaving the original records in place.
- Tab function to make formatting easier.

THE MAILING LIST

Most everyone wants a mailing list of some kind, whether for birthdays, anniversaries, or Christmas cards or for sending out advertising to customers.

For a simple example, take a Christmas card list. Just enter the name and address as it should appear into the text editor, print it out and you have a list. When you receive a card, keep track of it by checking the names off the listing.

It's handy at other times, too. Suppose your dog presents you with a litter of puppies and you need to find a home for them. Call up the Christmas card list. Let the printer type the envelopes for the letter you will prepare on the text editor.

A little BASIC program will read the list and print out the envelopes, except that some addresses have three lines and some have four lines. When does one address end and another start? A delimiter is needed. So back to the text editor again and insert a '*' after each address. While you are at it also insert a '?'. The list looks like this:

```
Mr and Mrs John B Smith
12345 Anywhere Road
Washington, DC 10101
*
?
Next name and address — and so on.
```

You might as well keep track of the cards sent and received. Add a 'S78' after the '*' and if you received a card also add 'R78'. The '*' delimiter record now looks like this:

*S78	Sent a card — did not get one.
*S78R78	Sent and received a card.
*R78	Goofed — got a card but didn't send one.

Now to the text editor to insert these flag records in the Christmas card list. The second name on the list is that of Aunt Martha. You know that Aunt Martha loves cats, so why shake her up by trying to give her a puppy. So instead of inserting just a '?' insert a '?N' for her and all those other good folks on the list that you know will not take one of those little pooches off your hands.

Here is a BASIC program that will handle the envelope addressing.

Next Christmas just change the program to type a list of all the people you want to send cards to. Naturally the text editor will be used to change addresses and add and delete names from the list. You can use the computer to type up any Christmas card envelopes.

Let's take the mailing list one step further before going on to other uses of the text editor. Suppose you sell three types of products. Some customers buy only one, others get two and some buy all three. To complicate matters, your advertising material comes out at different times and you want to make as few mailings as possible. This means that when the advertising for products A and B is ready, only the A, B, A and B customers will get a mailing. The AC, BC and C customers don't receive the mailing.

To keep track of what was sent and where it went, set up a flag system similar to the Christmas card list:

*A^^.	A customer
*^B^.	B customer
*^^C.	C customer
*AB^.	A & B customer
•	
*ABC.	A, B & C customer

By changing the match or compare parameters in the envelope program will produce a list, envelopes or mailing labels.

Just to keep things straight, go back with the text editor and add the mailing date. Search for '*A^^.' and replace it with '*A^^121579*A^^.' Note the use of the '.'. For listing, use a match on the first four character positions. After the next mailing use the search argument '*A^^.' to find the right records in the mailing list, then add the latest date. This is where a global search and change feature comes in handy. Now there is a record of who was sent what and when. For all practical purposes, there was no need to write a program to handle it.

ACCOUNTS RECEIVABLE

Suppose we use a '$' for each $100 due in a record followed by the word 'DATE'. When a payment is received, search for the customer and add the date and amount paid and change the number of '$'s and the balance. To find out who owes $200 or more, change the program to print out records that are associated with the '$$' flag. For those owing $200 to $299.99 look for '$$DATE'.

This method of handling mailing lists and accounts receivable is certainly not the ultimate by any means but it does allow the use of the computer to handle jobs quickly and more efficiently than by hand.

If, by chance, you have decided to write the world's finest inventory system but you need to keep track of stock *now,* don't despair. Use the text editor. Use a record format similar to the following:

```
STOCK # VNDR DESCRIPTION                          COST  BALANCE

xxxxxxxx  xxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxx    xxx.xx xxxxx
<  8  ><4>  <                27                ><6> <5>
```

Be sure the fields in each record start in the same position and that the decimal points in the cost field line up.

When items are shipped or received, use the text editor to search for the stock number then change the balance on hand.

Another field could be added to keep track of quantity on order. If you can do a global search and list, then use this feature to list out what products are ordered from which vendor.

A little BASIC program that reads the string record, VAL (MID$(STRING,X,Y);s the cost and balance on hand, multiplies them together then summarizes, will provide the current inventory cost.

Obviously this method will not automatically change the balance on hand when an invoice is written, nor is it practical when there are a lot of transactions in a day. But it might be a viable substitute until your inventory system is up and running.

A CHECK REGISTER

Set up a file that contains the normal information about a check plus an account number. Why the account number? Every year there is the annual income tax hassle. Let the computer do a lot of the work for you. The check register might look like this:

```
Act#  Ck#  Date    Paid to                    Amount
 xxx  xxxx  xxxxxx  xxxxxxxxxxxxxxxxxxxxx  xxxx.xx
<3>  <4>  < 6 >  <          20          >< 7 >
```

At the end of the year, assuming the file is up to date, the computer can sum up your deductibles. How about cash expenditures? There is nothing that says you can't use 'cash' instead of a check number. A fancy program that sorts the file and calculates the subtotals and totals for each set of account numbers can be written. Or something like the little inventory program can be used.

Go through the file once for each account number using a different search argument for each account number. Once again it's not the greatest feat in programming but it gets the job done.

CONTROL OPERATIONS

Besides being a good tool to create and maintain data files, the text editor is also useful for creating and maintaining tables used to control operations within a program. Use a table like DATA statements for such things as:

- Report headings
- Column headings
- Level of detail or summary
- Math calculations, etc.

The use of control tables lets one program be used for a number of applications.

The table shown below is used to allow one program to create and maintain a number of data files.

```
SP  LN  V  H  ED  NAME
xx  xx  x  x  x   xxxxxxxxxxxxx
•   •   •  •  •   •••••
```

SP — Start position of the field in a string record.
LN — Length of field.
V — Vertical position on CRT screen.
H — Horizontal position on CRT screen.
ED — Edit code.
NAME — Field name to be displayed on the CRT.

A program that uses this type of table first reads in the table then uses the table data to control the building of the screen fill-in mask. The table data then controls the cursor positioning for each field. As each entry is made the entry is edited according to the edit code and the field length supplied by the table.

Once each field has been entered and edited it is placed in its proper position in the output record as specified by the start position in the table. The record is now ready to be written. To change a record — read it in, break it up into fields, replace the field to be changed, concatenate the field back together and write it out.□

Program follows

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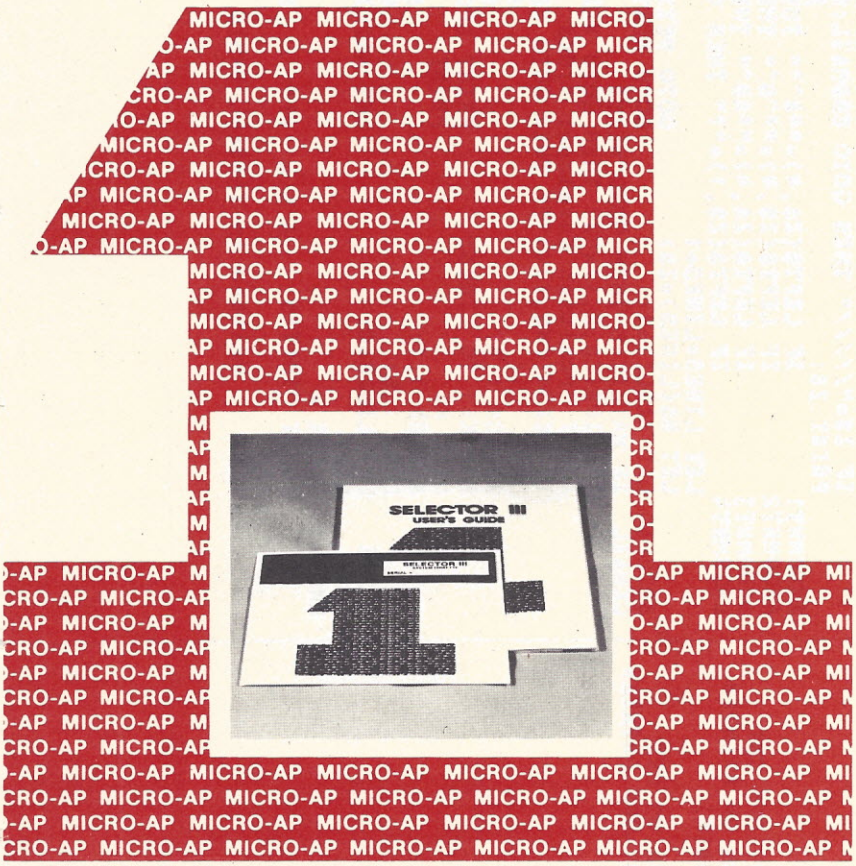

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The three major activities in business computing are...Word Processing, Financial Accounting, and the storing, processing, and reporting of information. The latter is where **SELECTOR III-C2** shines and fills the professional and personal need.

The system represents the state of the art using Micro-Ap's unique record indexing, query, and report writing methods. It's 'menu driven' and uses screen displays with all the instructions and error sensing that allow the novice to quickly learn the system and accomplish his tasks.

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- define a record format assigning up to 24 fields as 'key' fields -meaning that records can be instantly recalled by name, date, quantity, ZIP Code, or whatever.
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SELECTOR III-C2 is a 'turn-key' system that can manage most applications as is. It includes source-code and pre-defined record formats and sub-programs to perform the tasks listed at top of page. Programmers can easily add other sub-programs - using the system's powerful utilities - to perform virtually any special computation or function required.

The system runs under CBASIC Vers. 2, and is priced at $345. It's available in a variety of CP/M, disk formats including Dynabyte; North Star; Micropolis; TRS-80; Helios II; Heathkit; iCOM; Altair; Imsai; Cromemco; and others.

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PROGRAM A

```
>LIST
MAILENV REM *************************
        REM **                       **
        REM **  MAIL LIST PROGRAM    **
        REM **          by           **
        REM **      BILL  ROCH       **
        REM **                       **
        REM *************************
        REM
        DIM B$(5)
MAIL01  OPEN 2,"MAILIST":        LET LINES=0
        FOR I=1 TO 1000:         GET Z$: REM READ RECORD
        IF Z$="/////" THEN GOTO ENDMAIL:REM END OF FILE
        PRINT Z$:                        REM DISPLAY ON CRT
ARGUMNT1         IF LEFT$(Z$,1)="*" THEN GOTO NEXTI & 1
ARGUMNT2         IF LEFT$(Z$,1)="?" THEN GOTO CKMAIL
        LET LINES=LINES+1
        LET B$(LINES)=Z$:        GOTO NEXTI & 1
CKMAIL  IF MID$(Z$,2,1)="N" THEN GOTO NEXTI
        INPUT "Position Envelope: ";OK$
        IF LEFT$(OK$,1)<>"Y" THEN GOTO NEXTI
        DROP 1,1:                        REM SHUT OFF CRT
        ASSIGN 1,5:                      REM TURN ON PRINTER
        FOR K=1 TO LINES:        PRINT SPC(25);B$(K)
        NEXT K:                  PRINT
        ASSIGN 1,1:                      REM TURN ON CRT
        DROP 1,5:                        REM SHUT OFF PRINTER
NEXTI   LET LINES=0
        NEXT
ENDMAIL CLOSE 2
        PRINT "THAT'S    A L L  !!":     END
        REM
        REM     Written in TARBELL BASIC
```

INPUT FOR PROGRAM A

```
        ELMER GREENTREE
        ROUTE #6
        ARLINGTON  TX  76011
        *S78
        ?
        MARTHA TANNER
        1873 GOCIP ROAD
        HOGWASH  OK  74809
        *S78R78
        ?N
```

PROGRAM B

```
>LIST
MAILADV REM *************************
        REM **                       **
        REM **  MAIL LIST PROGRAM    **
        REM **          by           **
        REM **      BILL  ROCH       **
        REM **                       **
        REM *************************
        REM
        DIM B$(5):               LET MAILIT=0
MAIL01  OPEN 2,"ADMAIL":         LET LINES=0
        FOR I=1 TO 1000:         GET Z$: REM READ RECORD
        IF Z$="/////" THEN GOTO ENDMAIL:REM END OF FILE
        PRINT Z$:                        REM DISPLAY ON CRT
ARGUMNT1         IF LEFT$(Z$,4)="*A^^" THEN GOTO SETFLAG
ARGUMNT2         IF LEFT$(Z$,4)="*^B^" THEN GOTO SETFLAG
ARGUMNT3         IF LEFT$(Z$,4)="*AB^" THEN GOTO SETFLAG
ARGUMNT4         IF LEFT$(Z$,1)="?" THEN GOTO CKMAIL
        LET LINES=LINES+1
        LET B$(LINES)=Z$:        GOTO NEXTI & 1
SETFLAG LET MAILIT=1:            GOTO NEXTI & 1
CKMAIL  IF MAILIT=0 THEN GOTO NEXTI
        IF MID$(Z$,2,1)="N" THEN GOTO NEXTI
        INPUT "Position Envelope: ";OK$
        IF LEFT$(OK$,1)<>"Y" THEN GOTO NEXTI
        DROP 1,1:                        REM SHUT OFF CRT
        ASSIGN 1,5:                      REM TURN ON PRINTER
        FOR K=1 TO LINES:        PRINT SPC(25);B$(K)
        NEXT K:                  PRINT
        ASSIGN 1,1:                      REM TURN ON CRT
        DROP 1,5:                        REM SHUT OFF PRINTER
NEXTI   LET LINES=0:             LET MAILIT=0
        NEXT
ENDMAIL CLOSE 2
        PRINT "THAT'S    A L L  !!":     END
        REM
        REM     Written in TARBELL BASIC
```

```
PETER WILLIAMSON
2918 SAN RAMON DRIVE
APT # 135
STATE COLLEGE  PA  16801
*R78
?
/////



ELMER GREENTREE
ROUTE #6
ARLINGTON  TX  76011

PETER WILLIAMSON
2918 SAN RAMON DRIVE
APT # 135
STATE COLLEGE  PA  16801
```

Notice that Aunt Martha was not included in the envelopes addressed by the program.

PROGRAM C

```
>LIST
100 LET T=0
110 OPEN 2,"INVLIST"
120 FOR I=1 TO 1000
130 GET Z$:IF Z$="/////" THEN GOTO 190
140 PRINT Z$
150 LET C=VAL(MID$(Z$,43,6))
160 LET B=VAL(MID$(Z$,51,5))
170 LET T=T+B*C
180 NEXT
190 CLOSE 2
200 PRINT TAB(47-LEN(STR$(T)));T
210 END



>RUN
G-406781 BNDT DOOR,LEFT HAND, 3X8, BLUE      4.89    27
R-105782 ACME WINDOW, 8 LITES,3-1/2X4-1/4   12.98   106
S-409876 ACME WINDOW, 1 LITE 1X2             3.09  1074
W-000023 HBLT BOLT, SPECIAL, 3/8X9            .98  5804

                                        10514.49
```

INPUT FOR PROGRAM B

```
Broken Pipe Plumbing
345 Coupling Drive
New Leaks  PA  16105
*A^^
?
Fallen Arches Shoe Repair
10202 Laces Street
Flatfoot  OK  73128
*^B^
?
Down Home Gritts Company
24 East Main St.
Westminster  MD  21157
*AB^
?
Justin Casey Data Systems
P.O. Box 34-7/8th
Santa Monicsa  AZ   96743
*^^C
?
/////
```

```
Broken Pipe Plumbing
345 Coupling Drive
New Leaks  PA  16105

Fallen Arches Shoe Repair
10202 Laces Street
Flatfoot  OK  73128

Down Home Gritts Company
24 East Main St.
Westminster  MD  21157
```

Notice that Justin Casey, a 'C' type customer was omitted frmo the addresses printed.

A User's View of

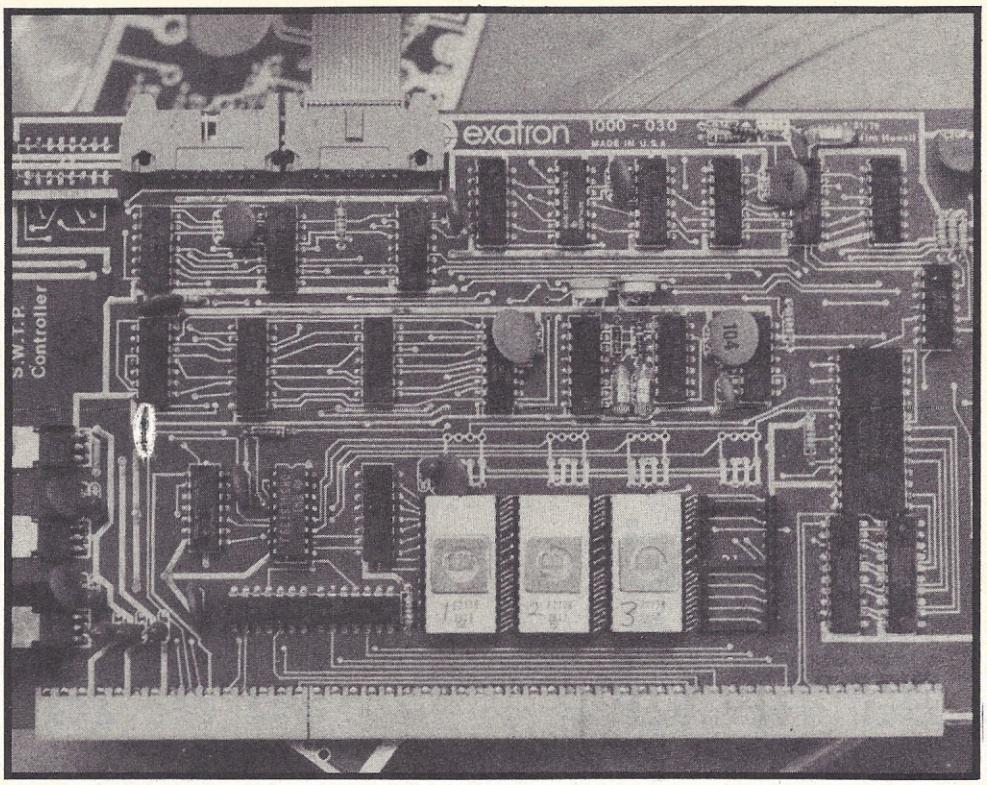

PHOTO 1

Stringy Floppy for the 6800

By Tom Mattingly

Are you unwilling to "shell out" more than $900 for a floppy disk? Don't despair because there is now an alternative: The Exatron Stringy Floppy. It is almost as fast, and just as reliable as the floppy disk. The cost is ½ to ⅓ less than a floppy disk.

As far as storage is concerned the stringy floppy can hold more than a cassette or single-density 5¼" disk. A 120-minute cassette using only one side at 30 characters per second can hold 108,000 total bytes. Only one side is used because a stringy floppy cannot be turned over. A floppy disk using the SWTPC model holds 70-86K total bytes according to my local SWTPC dealer. The stringy floppy in its longest length of 75 feet can hold 140,000 total bytes.

COST COMPARISON

In the cassette's case, the total cost of the cassette and interface would be about 55% less than the stringy floppy. For 55% less the user gets 30 characters per second data transfer and lots of cords to keep untangled. On the other hand, for about six times more, the user could get a floppy disk with a little more loading and 188% greater access speed than a stringy floppy. Or the user could purchase a stringy floppy which is 34.6% the cost of a floppy disk and has the same reliability with a slightly slower loading and access speed.

The media used in each unit must be good quality to reduce errors to a minimum. The average cost for a floppy disk is 45% more than a stringy floppy wafer. A good quality cassette costs an average of 60% more than a stringy floppy wafer, which costs about $2.

RELIABILITY AND SPEED

The two most important things in auxiliary storage are reliability and speed. The error rate for a floppy disk is the lowest of all kinds of auxiliary storage, 1 in 100,000,000 bits. The cassette's error rate depends on the cassette and the cassette player used. Therefore it is really difficult to estimate the error rate of the cassette. The stringy floppy has an error rate of 1 in 100,000,000 bits, the same as a floppy disk. Speed is the next important factor.

Using the SWTPC AC-30 cassette unit is probably the slowest of all three (cassette, stringy floppy and floppy disk). As the name implies, the AC-30 loads at 30 characters per second. BASIC, for example, loads in five minutes using a binary loader. It would take 15 minutes to load BASIC if MIKBUG and a standard ASCII dump was used.

The stringy floppy loads programs at 14,400 bits per second or 1600 characters per second (9-bit bytes). BASIC will load into programmable memory from the stringy floppy in roughly six seconds.

The SWTPC floppy disk loads at 125,000 bits per second or 13,888 characters per second (assuming 9-bit bytes and no overhead for the Disk Operating Sytem). The SWTPC floppy disk will load BASIC in roughly three seconds. That is slightly faster than the stringy floppy.

Although the stringy floppy matches the floppy disk in reliability and emerges second in speed, the stringy floppy is far preferable in terms of additional equipment required. The AC-30 requires a good cassette recorder which will record and playback without many mistakes. A good cassette recorder usually costs about $50. The AC-30 also requires three audio cables for record, playback and motor control.

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- Extended Page, Margin and Indent control
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- Super- and Sub-scripting
- Operator prompts and input
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- Header/footer lines
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CIRCLE INQUIRY NO. 33

The floppy disk requires a 4K or 8K programmable memory board for the Disk Operating System. The board is only needed *if* the user wishes to keep the same amount of free programmable memory that existed prior to buying the floppy.

On the other hand, the stringy floppy requires no extra cables and only a small amount, 32 bytes, for the input buffer. The stack is also stored in this area, so a few bytes more would be used.

SOFTWARE

After reliability and speed, software is the next important consideration. The cassette interface (AC-30) is supported with a BASIC, Assembler/Editor and Disassembler from SWTPC. Also many other companies support the AC-30 with software. The floppy disk has come a long way in software. Random access and sequential files with BASIC plus other software has made the disk a valuable item.

The stringy floppy for the SS-50 bus is limited at the present time. Exatron (the company that makes the stringy floppy) does have TSC 9K super-fast BASIC patched and working. Although this BASIC does not have data files, Exatron has gone to Microsoft for a full-fledged BASIC with data files and many other good features. Computerware has also become interested in the stringy floppy and Exatron is also working on their BASIC.

In addition to two BASIC languages, Exatron has been working on the TSC Assembler and Editor. It should be released by publication of this article.

HARDWARE

The controller board (see Photo 1) for the drive is a standard 50-pin, full-size board. The controller can handle two drives. Both drives can be accessed through the software. The controller also has room for four 2708s or four 4118 (1k x 8) programmable memories. As the board is shipped presently, it contains three 2708s. The board and erasable programmable read only memories (EPROM) are addressed at $C000-CFFF. This addressing can easily be changed by a set of switches at the top of the board and reburning the read only memories.

In addition to the read only memories, the controller contains a synchronous serial interface, a data encoder, a clock recovery circuit, and the necessary latches for peripheral control. Wherever possible the board uses complementary metal oxide semiconductor (CMOS) and low power transistor transistor logic (LSTTL) to provide low power consumption.

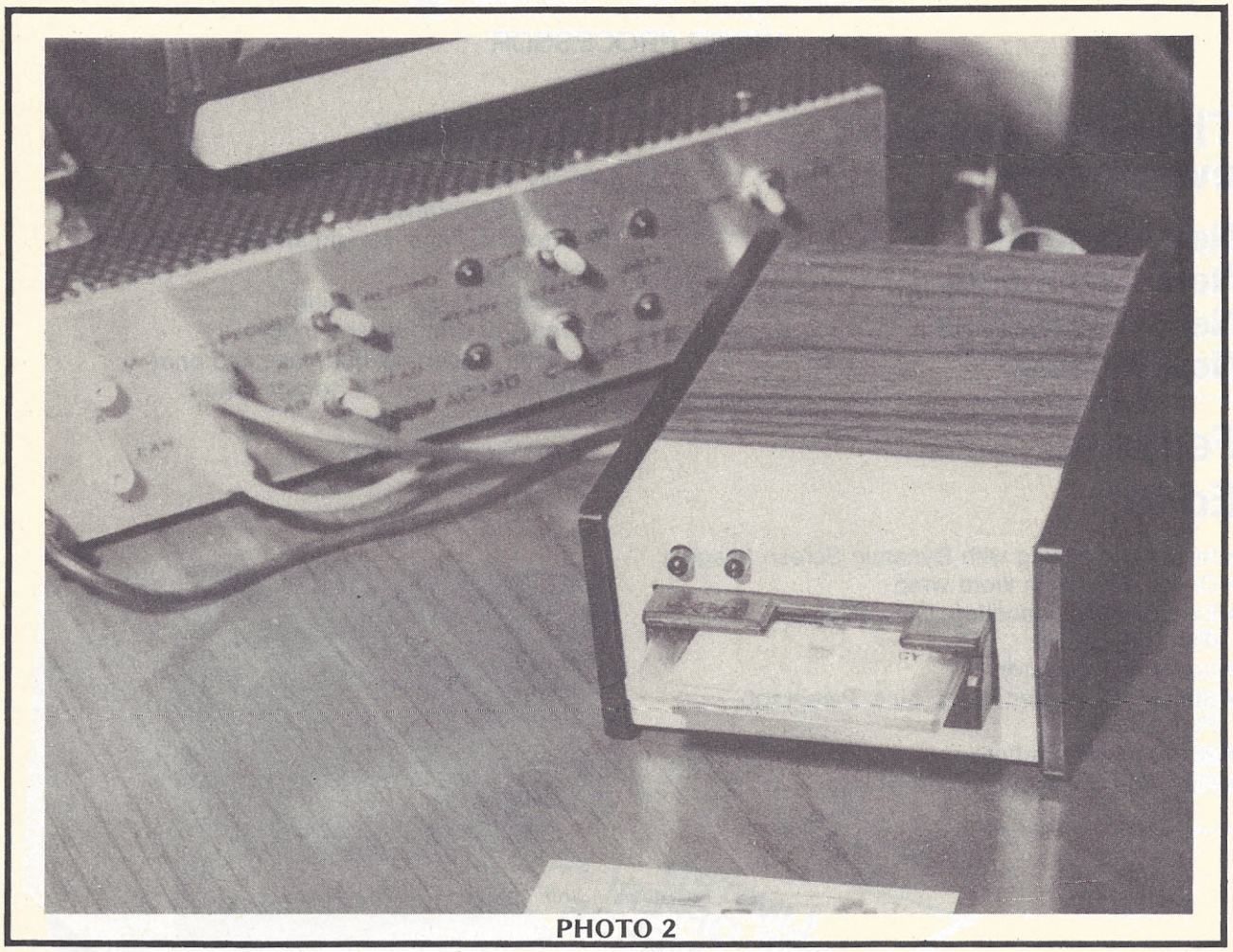

PHOTO 2

The drive, Photo 2, itself measures 4 3/16" wide by 5½" deep by 2¼" high (10.64cm x 13.97cm x 5.72cm). There are no switches on the drive; it simply includes two light emitting diodes (LEDs) and a slot to insert the wafer The right LED indicates motor on. The left LED indicates data being written to the tape.

The media (what the program is actually stored on) that fits into this drive is called a stringy floppy wafer. I believe that it was given this name for two reasons: "Stringy" due to the use of digital tape and its size, "Floppy" because of its similarity in reliability and its closeness in speed to the floppy disk. The size of the stringy floppy wafer is 1 9/16" wide by 2 11/16" long by 3/16" thick (3.97cm x 6.83cm x .48cm). The average life of the wafer is over 2500 hours. The drive has an average life of over 3500 hours.

ADVANTAGES AND DISADVANTAGES

The first advantage of stringy floppy is that no extra programmable memory is needed except for a 32-byte input buffer that can be placed anywhere in memory. Further, part

TRS-80 MODEL II FORMAT NOW AVAILABLE

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☐ **WORD-MASTER** Text Editor — In one mode has superset of CP/M's ED commands including global searching and replacing, forward and backwards in file. In video mode, provides full screen editor for users with serial addressable-cursor terminal ..... **$125/$25**

SOFTWARE SYSTEMS

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☐ **PASCAL/Z** — Z-80 native code PASCAL compiler. Produces optimized, ROMable re-entrant code. All interfacing to CP/M is through the support library. The package includes compiler, companion macro-assembler and source for the library. Requires 56K and Z-80 CPU.
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Version 3 Upgrade with variant records and strings expected 2/80. ..... **$395/$25**

☐ **PASCAL/MT** — Subset of standard PASCAL. Generates ROMable 8080 machine code. Symbolic debugger included. Supports interrupt procedures and BCD arithmetic for real variables, CP/M file I/O and assembly language interface supported. Lacks Sets, Enumeration and Record data types. Manual explains BASIC to PASCAL conversion. Requires 32K ..... **$95/$30**
Source for PASCAL/MT run time package. Requires MAC. (See under Digital Research.) **$50**

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STRUCTURED SYSTEMS GROUP

☐ **GENERAL LEDGER** — Interactive and flexible system providing proof and report outputs. Customization of COA created interactively. Multiple branch accounting centers. Extensive checking performed at data entry for proof, COA correctness, etc. Journal entries may be batched prior to posting. Closing procedure automatically backs up input files. All reports can be tailored as necessary. Requires CBASIC-2 ..... **$899/$25**

☐ **ACCOUNTS RECEIVABLE** — Open item system with output for internal aged reports and customer-oriented statement and billing purposes. On-Line Enquiry permits information for Customer Service and Credit departments. Interface to General Ledger provided if both systems used. Requires CBASIC-2 ..... **$699/$25**

☐ **ACCOUNTS PAYABLE** — Provides aged statements of accounts by vendor with check writing for selected invoices. Can be used alone or with General Ledger and/or with NAD. Requires CBASIC-2 **$699/$25**

☐ **ANALYST** — Customized data entry and reporting system. User specifies up to 75 data items per record. Interactive data entry, retrieval and update facility makes information management easy. Sophisticated report generator provides customized reports using selected records with multiple level break-points for summarization. Requires CBASIC-2, 24 x 8 CRT, printer and 48K system. ..... **$225/$15**

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Software with Manual / Manual Alone

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†CP/M for Heath, TRS-80 Model I and PolyMorphic 8813 are modified and must use specially compiled versions of system and applications software.
(M) Modified version available for use with CP/M as implemented on Heath and TRS-80 Model I computers.

(L) User license agreement for this product must be signed and returned to Lifeboat Associates before shipment may be made.

Shopping List No.8

Software for most popular 8080/Z80 computer disk systems including ***NORTH STAR, iCOM, MICROPOLIS, DYNABYTE DB8/2 & DB8/4, EXIDY SORCERER, SD SYSTEMS, ALTAIR, VECTOR MZ, MECCA, 8" IBM, HEATH H17 & H89, HELIOS, IMSAI VDP42 & 44, REX, NYLAC, INTERTEC, VISTA V80*** *and* ***V200, TRS-80 MODEL I*** *and* ***MODEL II, ALTOS, OHIO SCIENTIFIC*** *and* ***IMS 5000*** *formats.*

Orders must specify disk systems and formats: e.g. North Star single, double or quad density, IBM single or 2D/256, Altair, Helios II, Micropolis Mod I or II, 5¼" soft sector (Micro iCOM/SD Systems Dynabyte), etc.

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(212) 580-0082 Telex: 220501 *(New number!)*

of the storage in the 6810 chip is used. Secondly, the operating system is always there and can be accessed by the 'Z' command of SWTBUG™. Third, the media is small and more compact than a cassette or floppy disk. Next, the speed of BASIC loading in six seconds instead of five minutes makes a significant difference.

Although the following may be considered disadvantages, they are tolerable. First and most important is search time. It is not a lengthy amount of time but not a close competitor to the floppy disk. Secondly, some prefer the operating system in programmable memory so it could be changed. My response is that there is usually someone in your town or area that has a 2708 burner. If nobody has a burner, you can send the 2708s back to Exatron and they will reprogram them for $25. Third, this first version of the operating system does not have a CATALOG command. *Note:* Exatron is getting the bugs out of the second operating system which does have a CATALOG command.

Since the operating system is in erasable programmable read only memory, it does not have to be loaded but just jumped to by the 'Z' command of SWTBUG or by loading $A048_{16}$, and $A049_{16}$ with $C000_{16}$ and typing G. Once in the Exatron Operating System, commands can be typed in and executed. The commands currently supported are:

HSAVE,(filename)	Saves a program on the wafer
HLOAD,(filename)	Loads a program from the wafer
H	Jumps to $AD03 (Flex warms)
G	Jumps to $0100- user program, BASIC
EDIT	Loads and executes the TSC Text Editor
ASMB	Load and executes the TSC Assembler
ASN	Sets the density. 1 for single density (7200 bits per second), 2 for double density (14,400 bits per second)
NEWTAPE	Formats the tape and checks for defective sections
HOME	Positions the wafer at the beginning of the tape to write the first program
MON	Jumps to $E0E3 (SWTBUG)

The operating manual is small but compact and complete with all the information needed to use the system. Each of the above commands are explained in more depth in the manual. The manual also gives a brief explanation of the controller board and then explains how to access the Exatron Stringy Floppy Operating System.

Two things, though, should be mentioned that were not in the manual. One, the operating system and drive sometimes take more than one pass to certify the wafer is presently in the drive. This is mainly due to a normal "run-in" period similar to cassettes. Two, the tape can be write protected by removing the silver dot from the top of the wafer. Even when the operating system attempts to write and the left light emitting diode on the drive indicates a write, the drive does not write.

Due to the size and reliability of the drive, it is useful in some business applications. First, a small compact system using this drive as an auxiliary storage device would fit into any small business. Also, the system being used as a recorder of the daily transactions would work. Wordprocessing is another thought for the use of the system.

These are the benefits of the Exatron stringy floppy; forwards, backwards, software and hardware. As the software becomes more oriented toward a floppy disk type system with BASIC data files, and all the other features of a floppy disk type, the stringy floppy will become more popular.☐

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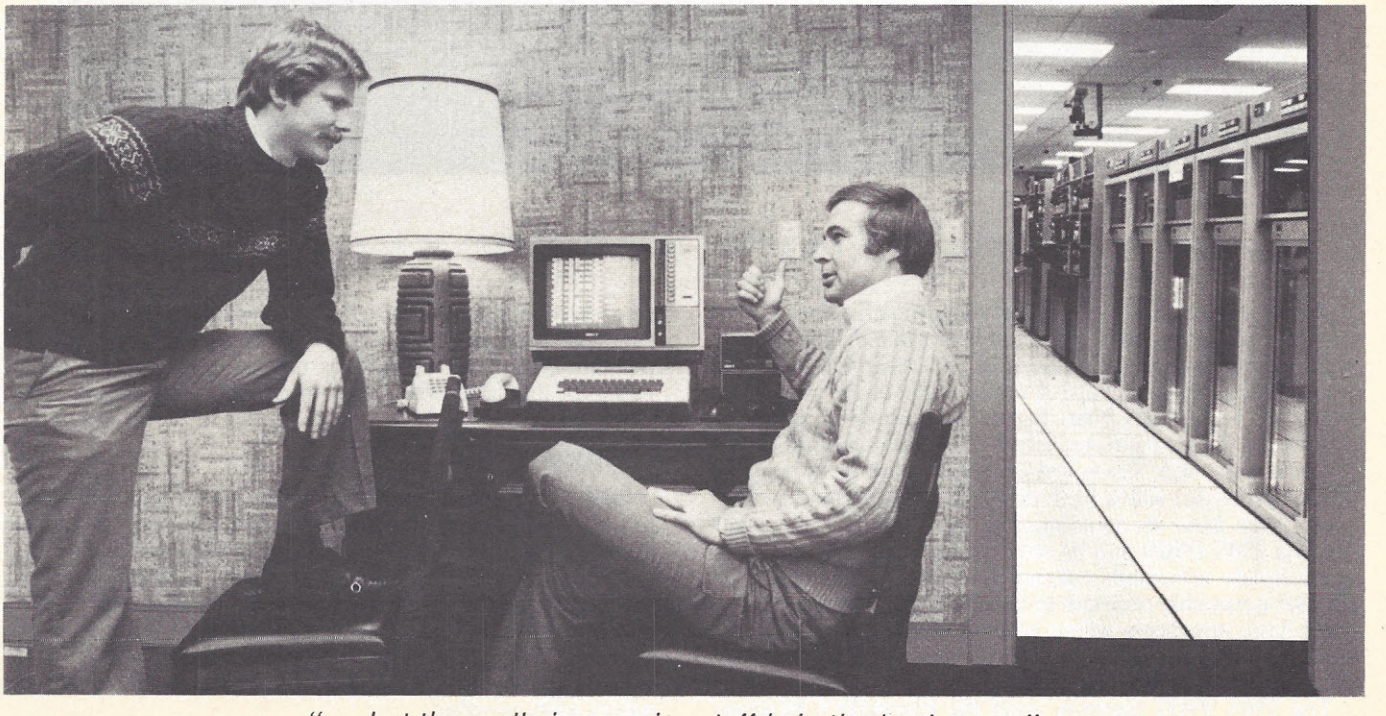
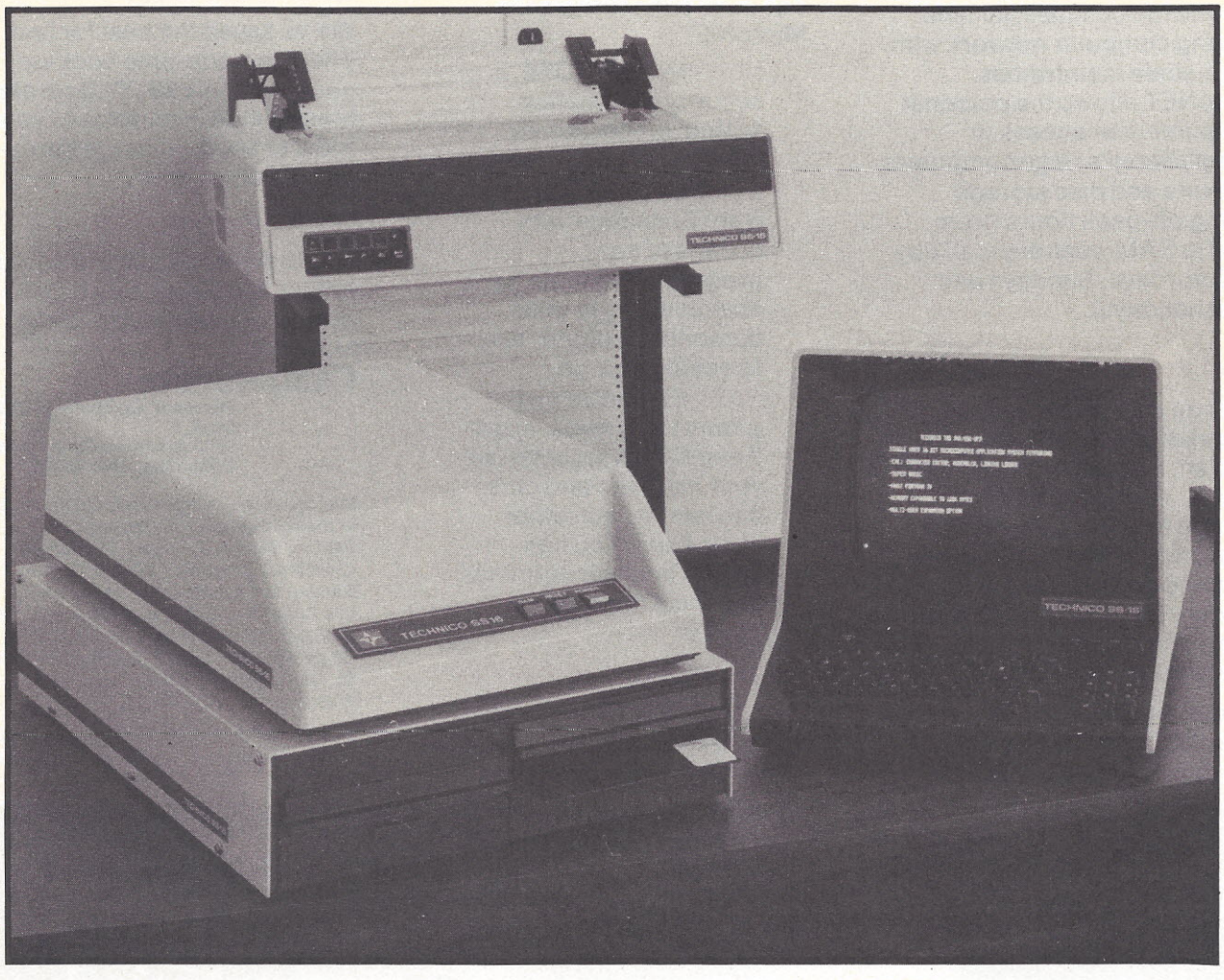


". . . but the really impressive stuff is in the back room."

Technico SS-16



By Tom Fox, Systems Editor

We have been looking forward to reviewing a Technico computer for some time now. The simple fact that it utilizes a 16-bit processor, making it a relative rarity in a field well populated with 8-bit designs, is part of the reason. More intriguing, however, is the fact that Technico computers are built around the Texas Instruments' TMS 9900 microprocessor.

Some years ago, Texas Instruments undertook to develop a microprocessor with a fresh design approach; one that borrowed little from its contemporary competitors. The result was the TMS 9900 and its siblings. Its most distinguishing characteristic is instantly noticed by programmers: There are no user-accessible registers to manipulate. (A register is the most basic receptacle within a computer to hold data for a short period of time while it is being operated upon — added, multiplied, saved into memory, etc.)

The TMS 9900 depends upon the computer's Random Access Memory (RAM) to hold register-type information, claiming great advantages in flexibility with this approach. In particular, multi-user programs can be written much more easily for the TMS 9900 than most other computers.

HARDWARE

Open the Technico hardware catalog, and you can't help but be impressed with the number and diversity of special products the company has developed to help the small computer interrelate with real world problems. In addition to the Central Processing Unit (CPU) itself, Technico builds four kinds of memory boards, three flavors of Input/Output (I/O) boards, a floppy disk subsystem and the usual collection of chassis, enclosures and power supplies to make all of the pieces work together.

The basic chassis is a rack-mountable one that holds up to six of Technico's 8" x 16" plug-in boards. The board size, as well as the non-standard 22-pin data bus, makes Technico parts definitely non-interchangeable with those of other manufacturers. Most buyers will opt for the 16" x 24" x 6" table top housing, which includes the six-slot card rack, interconnecting mother board, power supply, and basic front-panel controls.

Plug-in Random Access Memory boards are available in two sizes: 16 kilobytes or 32 kilobytes in capacity. The smaller board is actually a 32-kilobyte unit fitted with half a complement of memory chips, so it can be expanded in the future as the user's memory needs grow.

For multi-user systems, cards can be added to increase the memory capacity up to 512 kilobytes. An interesting accessory is a battery back-up board, which allows the retention of data contained on a 3K RAM board for up to 12 hours during power outages.

The CPU board is dominated by the giant (3¼" long) TMS 9900 microprocessor chip and includes some of the systems software on Read Only Memory (ROM) chips. It also includes I/O circuitry for 16 bits of parallel data and a single serial terminal device.

An unusual addition is 512 bytes (characters) of on-board RAM storage, expandable to 2048 bytes, as well as a built-in Erasable Programmable Read Only Memory (EPROM) programmer. This latter device is evidence of Technico's preference for supplying user programs via EPROM media, rather than the more usual floppy disk or tape.

Let's explain what this means. In most computers we see in business applications, the disks or cassette tapes cause your computer to read the programs and store them into the machine's Random Access Memory. For as long as that program is in use, it will stay in the RAM, unchanged until either you write another program over it or some unplanned incident (such as a power failure or faulty software) erroneously erases or rewrites part of the memory space.

Technico's approach is different. If you purchase certain of its software products (such as the BASIC language), you can take delivery in the form of pre-written EPROM chips, which plug into a memory board and contain a permanent image of the program. Once installed, you don't have to worry that the program will be destroyed by power fluctuations or many types of computer "crashes." Because of the EPROM programmer feature of the CPU board, any dealer or applications programmer can deliver software products by the same means.

Experts will argue that this approach has both positive and negative advantages, but the important thing is that Technico gives you the option to choose the path that fits your application. In order to provide a place to hold EPROM-supplied programs, two EPROM memory boards are offered: a 16-kilobyte version that holds 2708-type EPROMs and a 32-kilobyte board for 2716-type chips.

Technico has really done a job on accessories which interconnect the CPU with external inputs and outputs. For openers, there's a multifunction I/O expansion module, which will interface six serial devices (either RS-232 or 20 milliampere current loop signaling) and 32 bits of parallel input and output. This card merely provides additional numbers of the same kinds of interfaces supplied with the basic CPU board.

For applications such as large alarm systems, another board is offered which connects up to 128 bits of parallel input and output. With additional boards and card racks, an astounding 4096 bits of parallel I/O are possible.

One of the most powerful options is a combined digital-to-analog and analog-to-digital interface board featuring 10 bits of accuracy. This board will simultaneously convert up to 32 continuously varying voltages into digital signals that are palatable for CPU consumption. At the same time, it will change two separate digital signals into variable voltage outputs to control external devices. Sophisticated control of industrial processes would be impossible without analog/digital conversion such as that provided by this accessory.

For mass storage, Technico offers a dual or quad full-size floppy disk drive. Based on the Shugart SA-800 drives, these units come complete with all needed power supplies and cables in an enclosure intended to slip under the table-top computer housing. The disk drives are of the single-sided, single density variety, giving a total of one megabyte of on-line diskette storage when the full house is fitted.

The area of mass storage is one in which Technico has some catching up to do. More sophisticated floppy disk drives and several varieties of hard disk storage are now becoming available to the small business computer user.

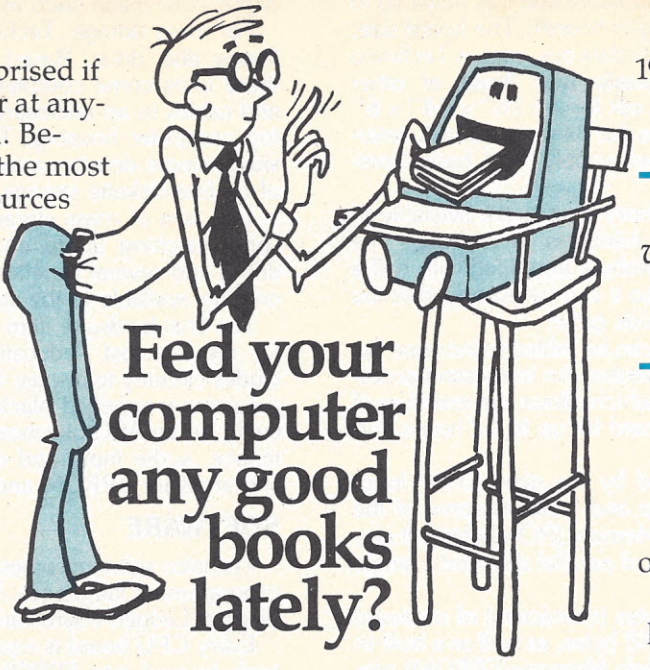
The final hardware item is a multi-function board intended for the low-cost "educational" computer products. It includes circuitry to display 1024 characters of information on a customer-supplied black and white TV screen, input circuitry for an ASCII keyboard, a 600 baud audio cassette interface, audio input and output (microphone and speaker) and areas for EPROM and RAM memory.

SOFTWARE

Technico software comes in two flavors: systems software and programming languages. The factory is also about to release General Ledger, Payroll and Inventory applications packages.

Every CPU board is equipped with two small but powerful tools burned into EPROM. The first is a Mighty Monitor, which includes eleven instant commands to interrogate and alter memory locations selectively, and run and debug programs written in the TMS 9900 machine language. Means are also provided to read and write programs onto a floppy disk or audio cassette, as appropriate to the installation.

The Mighty Monitor features one cute idea: upon power-up you can hit the "X" key on the terminal keyboard, and the system will deduce the terminal's baud rate (from 50 to 9600 baud) and automatically switch over to it for the duration of the session.



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Logic • Determines conclusions from logic statements.
Primes • Factors numbers into their primes.
Quadrac • Solves quadratic equations.
Regression 2 • Calculates linear regressions.
Roulette • Computerized "wheel of fortune" plays roulette.
Stat 10 • Calculates quantities for two groups of paired data.
Stat 11 • Computes sample statistics.
Top • Computes cost for surfacing road or driveway.
Vary • Performs analysis of a variance table; one-way random design.

Appendix B: ***Statement Conversion Algorithms***

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Instlo 78 • Computes real cost on financed items.
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Appendix C: ***Favorite Program Conversions***

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The other always-included systems-oriented program is the Instant Input Assembler (IIA), a bare-bones means to convert TMS 9900 assembler mnemonics into binary machine code. It does this immediately for each line of code entered, which makes it a handy tool for "patching" programs during debug sessions.

Serious assembly language programming, however, should be done by means of a far more complete Editor/Assembler/Loader package, which is available either in EPROM or floppy disk form. As the name indicates, the package includes a character-oriented Editor for entering the program source code, a conditional Assembler to reduce the source into relocatable object (machine executable) code, and a Loader which combines various assembled programs into a single, usable applications program.

The Disk/Tape Handler is a competent disk operating system which manages the retention of programs and data files on the magnetic storage media. It is provided on EPROM, so it is always instantly available for use. Featured is the extremely useful "wild card" means of file identification, which — once you understand how to use it — can save hundreds or even thousands of keystrokes every day for a busy programmer.

In the programming language department, Technico offers three: a Super Starter BASIC, a more serious 2K Super BASIC and their newest product, ANSI standard FORTRAN IV. The BASICs come either on PROM or floppy diskette; FORTRAN is available only via the latter medium.

Super BASIC is a truly fine example of this, the most common of microcomputer languages. It is a pure interpreter, but we were very impressed with its execution speed. A built-in editor allows program maintenance such as resequencing line numbers and globally changing variable names. PRINT USING is included, as is the ability to CHAIN to a subsequent BASIC program.

Handles are provided to manipulate directly the unique "memory registers" that distinguish the TMS 9900 from other micros. And here's a command that was a surprise to us: SORT. Usable only one one- and two-dimensional arrays that must exist as memory-resident variables (no disk sorting), SORT can nonetheless make one of the computer's most powerful capabilities almost painless to implement.

A two-pass FORTRAN assembler is available for users with a minimum of 34 kilobytes of memory and two floppy disk drives in their system. Although seldom an ideal language for business applications, FORTRAN is sometimes the best choice in those cases where useful programs are already written, or the programming staff is too stubborn to learn a more suitable language.

SYSTEMS

If you're confused by this profusion of hardware and software choices, take heart. Technico has surveyed their customer needs in order to define a more modest number of recommended assemblages of these bits into recommended systems. The smallest is an $895 Educator system — hardly suitable for a serious business application — and the largest, a $7895 multi-user system with 96 kilobytes of memory and a pair of floppy disk drives. (All the system prices are quoted less any terminals or printers.)

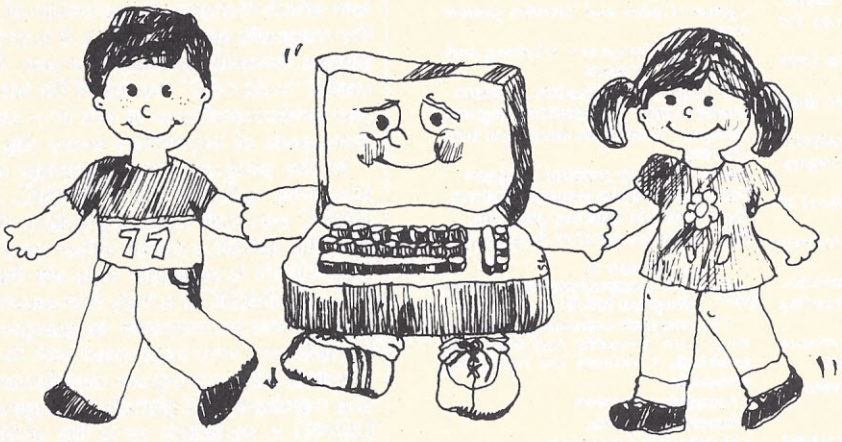
A good choice for many businesses would be the $6295 TAS 64K-DFD, which features 64 kilobytes of memory, a dual floppy disk drive, the Mighty Monitor and Instant Input Assembler, disk operating system, the Editor/Assembler/Loader and Super BASIC.

One of Technico's most appealing philosophies is that any of the systems can be expanded into a larger one with a minimum of hardware that must be thrown away during the transition. A second dual floppy disk drive, for example, lists for $2395. Expansion to the multi-user configuration goes for a reasonable $1895, including 32 kilobytes of additional memory, the multifunction I/O expansion module and multi-user operating monitor on EPROM.□

My TRS-80 Likes Me

When I Teach Kids How to Use It

Part 6



By Bob Albrecht

MORE INTERESTING PATTERNS

In previous articles, we have shown you programs to do arithmetic and geometric sequences. Now we will look at ways to generate patterns such as the following.

(1) 11, 111, 1111, 11111, and so on.
(2) 99, 999, 9999, 99999, and so on.
(3) 32, 332, 3332, 33332, and so on.
(4) 34, 334, 3334, 33334, and so on.

Interesting things happen when we compute the *square* of each number in one of the above patterns. How do we get the computer to generate the patterns? In particular, how do we write a program to generate *any* pattern of the above type, using as few "get started" numbers as possible?

For patterns (1) and (2), it's easy.

PATTERN (1)

First number is	11
Second number is	111 = 10*11+1
Third number is	1111 = 10*111+1
and so on.	

Aha! Next number = 10*Previous number + 1

Or, in BASIC: S = 10*S+1

Which says: Multiply the value of S by 10, then add 1 to that result, then assign the final result as the new value of S.

PATTERN (2)

First number is	99
Second number is	999 = 10*99+9
Third number is	9999 = 10*999+9
and so on.	

Next number = 10*Previous number + 9

S = 10*S+9

So, from the evidence in working with Patterns (1) and (2), it looks as if we need two numbers to *define* a pattern of this type. We will call them S and B.

S = Starting number

B = Number to add on after multiplying the old value of S by 10.

Then, the next value of S is computed like this.

S = 10*S+B

But, alas, it doesn't work for patterns (3) and (4). Oh well, back to the old drawing board.

Time passes. . .eureka!. . .here is a way to get pattern (3).

First number is	32
Second number is	332 = 10*(32+1)+2
Third number is	3332 = 10*(332+1)+2
and so on.	

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(Level "A" makes a perfect OEM controller for industrial applications and is available in a special Hex Version which can be programmed using the Netronics Hex Keypad/Display.)

Level "A" at $129.95 is a complete operating system, perfect for beginners, hobbiests, or industrial controller use.

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System Monitor (Hex Version): Tape load with labeling... tape dump with labeling...examine/change contents of memory...insert data...warm start...examine and change all registers...single step with register display at each break point ...go to execution address. Level "A" in the *Hex Version* makes a perfect controller for industrial applications and can be programmed using the Netronics Hex Keypad/Display.

Hex Keypad/Display.

Hex Keypad/Display Specifications

Calculator type keypad with 24 system defined and 16 user defined keys. 6 digit calculator type display which displays full address plus data as well as register and status information.

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Explorer/85 with Level "C" card cage.

Level "C" Specifications

Level "C" expands Explorer's motherboard with a card cage, allowing you to plug up to six S-100 cards directly into the motherboard. Both cage and cards are neatly contained inside Explorer's deluxe steel cabinet. Level "C" includes a sheet metal superstructure, a 5-card gold plated S-100 extension PC board which plugs into the motherboard. Just add required number of S-100 connectors

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Level "D" provides 4k or RAM, power supply regulation, filtering decoupling components and sockets to expand your Explorer/85 memory to 4k (plus the original 256 bytes located in the 8155A). The static RAM can be located anywhere from ØØØØ to EFFF in 4k blocks.

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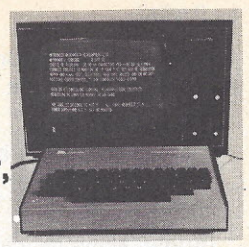
By Netronics

ASCII/BAUDOT, STAND ALONE



Computer Terminal

COMPLETE FOR ONLY... $149.95

The Netronics ASCII/BAUDOT Computer Terminal Kit is a microprocessor-controlled, stand alone keyboard/terminal requring no computer memory or software. It allows the use of either a 64 or 32 character by 16 line professional display format with selectable baud rate, RS232-C or 20 ma. output, full cursor control and 75 ohm composite video output.

The keyboard follows the standard typewriter configuration and generates the entire 128 character ASCII upper/lower case set with 96 printable characters. Features include onboard regulators, selectable parity, shift lock key, alpha lock jumper, a drive capability of one TTY load, and the ability to mate directly with almost any computer, including the new Explorer/85 and ELF products by Netronics.

The Computer Terminal requires no I/O mapping and includes 1k of memory, character generator, 2 key rollover, processor controlled cursor control, parallel ASCII/BAUDOT to serial conversion and serial to video processing—fully crystal controlled for superb accuracy. PC boards are the highest quality glass epoxy for the ultimate in reliability and long life.

VIDEO DISPLAY SPECIFICATIONS

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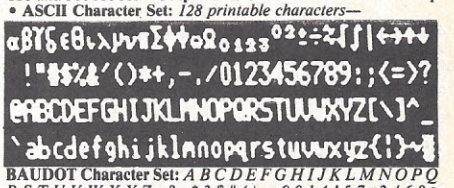
When connected to a computer, the computer must echo the character received. This data is received by the VID which processes the information, converting to data to video suitable to be displayed on a TV set (using an RF modulator) or on a video monitor. The VID generates the cursor, horizontal and vertical sync pulses and performs the housekeeping relative to which character and where it is to be displayed on the screen.

Video Output: *1.5 P/P into 75 ohm (EIA RS-170)* • **Baud Rate:** *110 and 300 ASCII* • **Outputs:** *RS232-C or 20 ma. current loop* • **ASCII Character Set:** *128 printable characters—*



BAUDOT Character Set: *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z - ? : * 3 $ # ( ) . , 9 0 1 4 ! 5 7 ; 2 / 6 8* • **Cursor Modes:** *Home, Backspace, Horizontal Tab, Line Feed, Vertical Tab, Carriage Return. Two special cursor sequences are provided for absolute and relative X-Y cursor addressing* • **Cursor Control:** *Erase, End of Line, Erase of Screen, Form Feed, Delete* • **Monitor Operation:** *50 or 60Hz (jumper selectable.*

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In BASIC, S = 10*(S+1)+2

Hmmm. . .will it work for pattern (4)? Almost. We have to make a slight change.

First number is	34
Second number is	334 = 10(34−1)+4
Third number is	3334 = 10(334−1)+4
and so on.	

Insight! Hang on while we take the big jump. (Don't be afraid; it's fun!)

PATTERN (1):	11, 111, 1111, etc.
	S = 10*(S+0)+1
PATTERN (2):	99, 999, 9999, etc.
	S = 10*(S+0)+9
PATTERN (3):	32, 332, 3332, etc.
	S = 10*(S+1)+2
PATTERN (4):	34, 334, 3334, etc.
	S = 10*(S+(−1))+4

Now we have got it. To get the next number, do these things.

(1) Add something to the previous number. This something *might* be a negative number (as used in Pattern (4)).
(2) Multiply the result by 10.
(3) Add something to that result.

In BASIC, S = 10*(S+A)+B

So, without further ado, here is a program which READs S, A and B from a DATA statement, then starts the pattern defined by those numbers. This program is very similar to Numbers Patterns No. 3 which we showed you last time.

```
100 REM***NUMBER PATTERNS NO. 4
110 CLS

200 REM***READ THREE NUMBERS WHICH DEFINE PATTERN
210 READ S,A,B
220 IF S=1E37 THEN PRINT "I'M OUT OF PATTERNS":END

300 REM***SHOW THE 'LATEST' NUMBER, S
310 PRINT S

400 REM***WAIT FOR KEY PRESS, 'SPACE' OR 'Q'
410 KEY$=INKEY$ : IF KEY$="" THEN 410
420 IF KEY$=" " THEN 510
430 IF KEY$="Q" THEN 110 ELSE 410

500 REM***COMPUTE NEXT NUMBER IN PATTERN
510 S=10*(S+A)+B
520 GOTO 210

900 REM***VALUES OF S, A, B
910 DATA 11,0,1, 99,0,9, 32,1,2, 34,−1,4
920 DATA 1E37, 1E37, 1E37
```

The "flag" which says there are no more values. See line 220.

BIG NUMBERS

Trouble! Here is what happened when we ran the program (Number Patterns No. 4) and pressed the space bar several times.

```
11
111
1111
11111
111111
1.11111E+06
1.11111E+07
1.11111E+08
```

Well, as you probably know, BASIC usually lets you use numbers with up to 6 digits. If a number is bigger than 999999, the computer flips into floating point notation (1.1111E+6, 1.11111E+07, and so on).

Double precision to the rescue! The TRS-80 (with Level II BASIC) will let you use up to sixteen digits. That's almost triple precision.

How? It certainly didn't do it in the above example!

METHOD ONE: Rewrite lines 210, 220, 310 and 510 as follows.

```
210 READ S#, A#, B#
220 IF S#=1E37 THEN PRINT "I'M OUT OF PATTERNS":END
310 PRINT S#,
510 S#=10*(S#+A#)+B#
```

Oh yes. . .we know you are out there looking at us skeptically. But, try it and see what happens. Here is why.

S, A and B are single precision numeric variables which can hold numbers with up to 6 digits.

S#, A# and B# are *double precision* numeric variables which can hold numbers with up to 16 digits.

What's the difference? The # sign is the difference.

S is a *single* precision numeric variable.

S# is a *double* precision numeric variable.

METHOD TWO: *Don't* rewrite lines 210, 220, 310 and 510. Instead, add the following line to the original program (Number Patterns No. 4).

```
120 DEFDBL S, A, B
```

This statement tells the TRS-80 that all variables which begin with the letters S, A or B are *double precision* variables. Double precision variables can hold up to 16 digits before flipping into floating point.

Use either Method One or Method Two to modify the program. Then RUN it; this might happen:

```
11
111
1111
11111
•
•
•
1111111111111111
1.1111111111111111D+16
1.1111111111111111D+17
etc. (unless you press Q)
```

Well, it had to flip into floating point sometime. For double precision numbers, the computer uses D instead of E before the exponent.

COMPUTERTOWN, USA

By the time you read this, about half of the 8- to 13-year-old kids in Menlo Park, California, will have learned how to use computers and have access to them in public places: the library, Kepler's Books, Round Table Pizza and other spots unknown to us as we write this episode of "My TRS-80 Likes Me." Many of these kids will have *taught themselves* how to program in BASIC, using "Teach Yourself" instructional materials available in the Menlo Park Library.

And that's only the beginning. In a few more months, almost all 8- to 13-year-old kids in Menlo Park will know how to use and have access to computers. If you want more information, send a stamped, self-addressed envelope to Computertown, USA, P.O. Box 310, Menlo Park, CA 94025.□

BOOK REVIEWS

SUPER-WUMPUS

By Jack Emmerichs
Byte Publications. 79 pages, $6
Review by Alan R. Miller, Software Editor

On the surface, Super-Wumpus appears to be a very complex and interesting computer game. A game that might appeal to the younger programmers. But there is another consideration. Lengthy BASIC games such as STAR TREK provide one of the best means of testing main memory.

An extended BASIC interpreter, such as Microsoft's version 4, combined with a 10K BASIC source program, will occupy the lower 30K bytes of memory. BASIC's stack is placed in the upper limit of memory and grows downward from there. Thus, nearly all of the user's memory is being exercised. More than once, I have located a bad memory chip this way when the more usual memory-test programs could find no problem.

The first part of the book describes the rules of the game and something about the programming. A sample run is then printed. Two source listings follow, one in 6800 assembly language and the other in North Star BASIC.

At the end of the book, both of the listings are presented in a bar-code format similar to the bar codes printed on many consumer products. The inclusion of a punched paper tape of the BASIC source program would be nice.

Conversion of the North Star BASIC format to the more usual BASIC is more of a chore than is suggested by the author. Changing backslashes to colons in multi-statement lines is easy. The conversion of two multi-line functions to subroutines, where local-variable construction is not available, is more difficult.

There is a problem with logical expressions. For most BASICs (and assemblers), the expression NOT 0 is evaluated as —1, and NOT —1 is 0. But with North Star BASIC, for some reason, NOT 0 produced 1 and NOT 1 gives 0 (NOT —1 is —).

String operations are also unusual. For example, the expression:

```
C$(R,R)=X$          must be changed to
C$=LEFT$(C$,R-1)+X$+MID$(C$,R+1)
```

and

```
IF C$(R,R) ...      goes to
IF MID$(C$,R,1) ...
```

When all these idiosyncracies are considered, Wumpus works fine with the more usual version of BASIC.□

Z-80 INSTRUCTION BOOK

By Nat Wadsworth
Scelbi Publications, 1978
Review by Alan R. Miller, Software Editor

One of the first issues of INTERFACE AGE contained a two-page summary of the 8080 instruction set. The mnemonic was given along with the corresponding value in decimal, hexadecimal, and octal. On one page, the instruction set was ordered numerically, on the other it was ordered alphabetically. These two pages are extremely useful for 8080 assembly-language programming and debugging, since they concisely present the entire instruction set.

There is apparently nothing equivalent to these tables for the Z-80 CPU. Barden's Z-80 Microcomputer Handbook thoroughly covers all aspects of the Z-80, but does not give a short summary of the instruction set.

Wadsworth's book fills a good portion of the void. It is not a textbook, but rather a reference manual for those already familiar with the Z-80. The first half is devoted to a brief but complete summary of the instructions. It is well organized. For each section, there is a detailed discussion of how the PSW condition flags (zero, parity, sign, etc.) are affected. For example, the Z-80 (unlike the 8080), does not produce a signal indicating the state of the interrupt-enable flipflop. Wadsworth points out that the LDAI and LDAR instructions will copy the contents of the interrupt-enable flipflop into the PSW parity/overflow flag for testing by the programmer.

The second part of the book presents the instruction mnemonics in alphabetical order, along with the octal and hexadecimal codes. The required number of computer clock cycles, and the corresponding page number in the first section are also given.

There are several different sets of mnemonics for the Z-80. The Zilog version is eminently logical, but entirely different from the 8080 set. The Xitan assembler, on the other hand, retains all the traditional 8080 symbols and adds 8080-like symbols for the similar Z-80 operations. In this case, SBCD is used instead of LD dddd,BC. Wadsworth has decided to give only the Zilog mnemonics.

While a numerical listing of the mnemonics would double the value of this handbook, it will still prove to be a useful addition to the Z-80 programmer's library.□

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How To Write Readable Programs

By LeRoy Finkel

Presented in this article is a model for developing programs in modular form so that they may easily be adapted for use by readers. Some of the ideas are similar to rules for structured programming. Most of these ideas are merely good programming techniques that seem to have gone astray or been forgotten altogether.

Most of these suggestions do *not* save program space, nor do they speed up the run of the program. Rather, the focus is on preparing *readable* programs. Nonetheless, these suggestions should help you write better programs whether they be for personal use, publication or on the job. Remember that in addition to working correctly, the program should be communicating the logic and thought processes to the reader.

No matter which software system is used to prepare the program (Microsoft or whatever), there is probably only one chance in thirty that a reader can use your program without making any changes. By being extremely sensitive to this fact when writing the program, it will be that much easier for the other twenty-nine users to adapt it for their individual use. And that's what it's for.

Not all of these suggestions are my original ideas. Some come from years of teaching beginners how to program in BASIC. Some come from computer professionals and represent their ideas on good programming style. Some come from *The Little Book of BASIC Style,* by John Nevison, published in 1978 by Addison-Wesley Publishing.[6] Nevison's ideas provided the impetus for this article and many of his ideas are shown here.

THE LANGUAGE YOU USE

"In the beginning" there was Dartmouth BASIC. Then Expanded BASIC, Extended BASIC, SuperBASIC, TinyBASIC, Microsoft BASIC were developed and finally, a standard BASIC in the form of ANSI Minimal BASIC (to name a few). They all "look alike" but each has its own distinct variations.

With so many different versions of BASIC, how can anyone write one program that will work on all systems? You can't! But programmers can help others who wish to use the program by using the *least* number of language features that are unique to specific versions of BASIC. Look at Dartmouth BASIC or ANSI Minimal BASIC as a standard form from which programs should start. The closer programs are to these standards, the more useful they will be to others. In other words, make a conscious effort to *not* use all the bells and whistles available in various versions of BASIC.

For example, writing programs with multiple statements in one line saves user space and speeds up the running of the program. However, readers will find it nearly impossible to follow this logic. Time-share users on large computers and many minicomputer users will have to completely rework the programs in order to use them because multiple statements per line may not be allowed on their systems.

For publication purposes, write all programs one statement to a line. Readers who wish to convert them to multiple statements per line will have a much easier time than when the reverse is necessary.

When using single or double arrays in a published program, do not use the zero element; e.g. A(0). Not all BASIC systems start arrays at zero, but all BASICs do have the one element; A(1). Making this simple change will help readers substantially. When possible, avoid the use of substrings. Substring statements vary in how they work from BASIC to BASIC. Cassette files and disk files and graphic display statements also vary dramatically from BASIC to BASIC.

Another language suggestion comes from an article by Edward Yourdon, published in *Infosystems* Magazine in 1976. Yourdon makes suggestions that apply to programming as well as showing what others might have to face when they use those programs. "The real superprogrammer learns, for example, not to implicitly trust any vendor-supplied hardware manual or programming manual; he/she learns to use certain hardware or language features with great caution, because they hardly ever work."[7]

MAKE IT LOOK GOOD

In Nevison's book we find some excellent suggestions to make programs look good and, thus, be easier to read. One easy suggestion: use line numbers of equal length. If your program is small, use line numbers 100-999. If long, use 1000-9999. When the program is listed, the code will be evenly spaced from the left margin and indented, making it easier to read. I would also suggest that you resequence or renumber your statements in increments of ten to make them easier to read and follow. If your BASIC has no renumber command, consider rewriting your program before submitting it for publication.

Write the program in blocks or modules with a blank line or remark statement between blocks. Since most BASICs do not allow the use of a blank line, a remark statement without any comments can serve the same purpose of separating blocks. Make liberal use of remark statements to explain to the reader what the program is doing next. In order to distinguish these comments in remark statements from BASIC code, indent the content of the remark statements as shown in Figure 1.

If the BASIC being used does not automatically space out code when LISTed, please take the extra time to type the program with a space between letter variables and words, a space between relational operators, a space to set off all BASIC commands and spaces wherever they will enhance looks and clarity (see Figure 1).

```
100   REM     THIS MODULE COMPOUNDS INTEREST
110   REM     ON A BEGINNING AMOUNT ,B UNTIL
120   REM     THE ENDING AMOUNT ,E, EXCEEDS
130   REM     $170.85. THE INTEREST RATE  IS
140   REM     7%. THE RESULTS ARE PRINTED FOR
150   REM     EACH PERIOD.
160   REM
170   LET B=100
180   LET E=0
190   LET I=0
200   REM
210   PRINT "BEG. AMT","INTEREST","END. AMT."
220   IF E>170.85 THEN 300
230   LET I=.07*B
240   LET E=B+I
250   PRINT B,I,E
260   GOTO 220
270   REM

      WEAK
10 REMCOMPOUND INTEREST
15LETB=100
17    LETE=0
20LET T= 0
100IF R>170.85THEN230
125 LET I =.07*B
137LEE E = B + I
150PRINTB,I,E
180GOTO 125
```

Figure 1.

THE IMPORTANT INTRODUCTION

The first module of code (lines 100-199 or 1000-1999) should contain the introduction, user instructions and the initialization of variables and arrays. The very first line should

contain the program name, selected carefully so that it tells the reader something about what the program does. The same line should contain the name of the author and the date.

Closely following should be the name of the computer system and/or software system used. Nevison suggests that this who-what-when statement is the program's birth certificate and that it should be changed each time the program is altered.[6]

```
SCR
100 REMARK     STARS, A NUMBER GUESSING GAME.
110 REMARK     PEOPLE'S COMPUTER COMPANY, 1974
120 REMARK
130 REMARK     MODIFIED FOR MICROSOFT BASIC BY J.BROWN,1978
140 REMARK
```

Figure 2.

The "birth certificate" should be followed by an introduction contained in remark statements, or, if appropriate, an introduction and instructions contained in print statements, available at the user's request. There are occasions when both an introduction in remark statements and printed instructions are needed. Both should be included in this introduction module.

The third section of any introduction should identify the variable, string variables, and arrays that are used and explain how they are used. Many BASICs do not allow multi-letter variable names such as SALARY, TOTAL, etc. Therefore, it is preferable that a single letter (A) or letter and number (A9) variable name be used.

Pick a variable name that will be remembered, one that makes sense to the reader. Use T for total, S for salary, T9, perhaps, for grand total, etc. The letters O (oh) and I are not good variable names as they are too easily confused with numerals. One should also consider assigning a variable name to all constants, even though a constant will not change during the running of a program. The constant may, however, change values between runs and by assigning it a name and value, it will be that much easier to change the program.

```
100  REM    HISTGRAM    17 JULY 1977    JOHN M. NEVISON
110  REM
120  REM    PRINT A HISTOGRAM OF THE DISTRIBUTION
130  REM    OF N9 VARIABLES
140  REM
150  REM    VARIABLES:
160  REM        H()...THE LENGTH OF EACH HISTOGRAM BAR
170  REM        I.....THE HISTOGRAM INTERVAL
180  REM        J,K...INDEX VARIABLES
190  REM        M.....THE MAXIMUM H()
200  REM        X.....A RANDOM NUMBER
210  REM
220  REM    CONSTANTS
230       LET H9 = 20
240       LET L9 = 35
250 REM
260       LET N9 = 300
270       LET R9 = 3
```

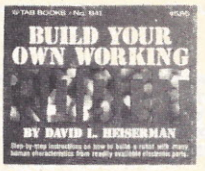
Figure 3.

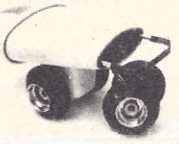
The final introductory section should initialize arrays, string variables and variables, when needed. DIMension all string variables whether or not your version of BASIC requires it. DIMension all single and double arrays, even though it may not be necessary. These items provide valuable information to the

```
1400   REM
1410   REM      INITIALIZE
1420   REM
1430   DIM R$[3],N$[20],T[8],D[10,12]
1440   REM
1450   LET N=0
1460   LET Z=0
1470   REM
1480   FOR X=1 TO 10
1490   FOR Y=1 TO 12
1500   LET D[X,Y]=0
1510   NEXT Y
1520   NEXT X
1530   REM
```

Figure 4.

Puzzled About Computers?





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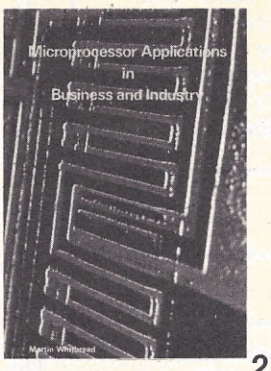

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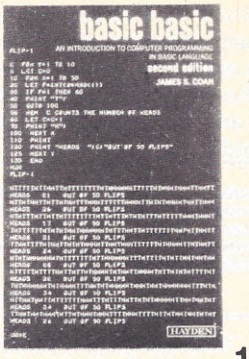

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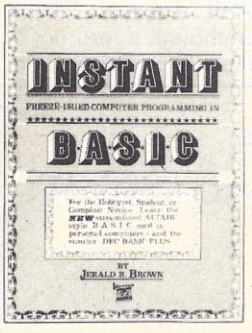

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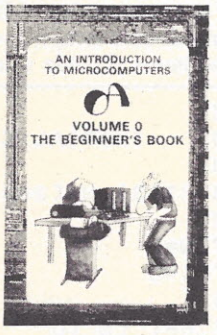

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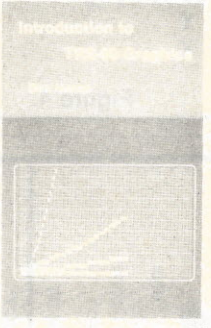

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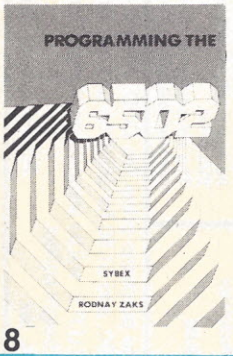

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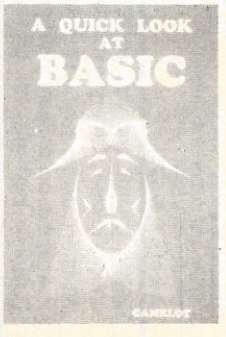

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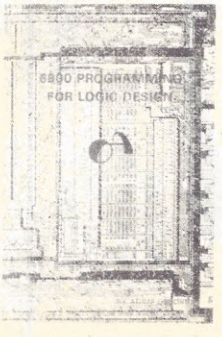

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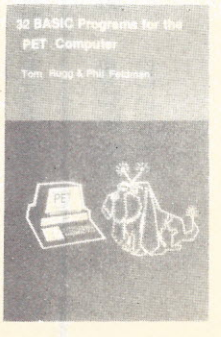

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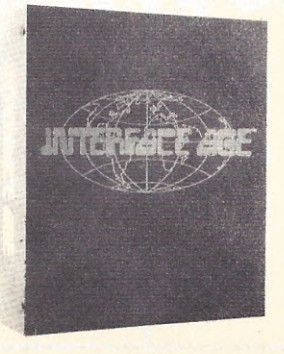

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reader. Not all BASICs automatically zero out arrays and variables. Therefore, code small routines that will zero out those arrays and variables that need to start with a zero value.

THE CODE YOU USE

To make programs more readable, use very conservative programming techniques. Yourdon suggests, "contrary to the popular myth, most *real* superprogrammers do not use clever, tricky coding sequences unless they really know the hardware and/or the language extremely well. . .they usually write very simple straight line code; they tend to use defensive programming techniques, so that if a bug *does* exist in their code, its scope will be limited. . ."[7]

We could stop right there, but let's add some of Nevison's ideas and some of my own. Make your line of code easy to read from left to right in the same manner the reader is predisposed to read. In IF THEN statements, place the most varying variable first and compare it to the least varying variable.

```
200 REM     LEFT TO RIGHT
210 REM
300       DATA "FIRST", "MIDDLE", "LAST"
310 REM
400       IF R <> 7 THEN 430
410 REM
500       READ A, B, C
510 REM
600       DEF FNF(X) = 2*X↑2 + 3*X + 4

100 REM     MAXIMUM
110 REM
120         FOR I = 1 TO 10
130           IF D(I) <= M THEN 150
140             LET M = D(I)
150         NEXT I
```

Figure 5.

To make a BASIC statement easier to comprehend, it may be necessary to break a long expression into several short expressions. Nevison suggests that you "make the line easy to read *aloud*" and it will be easier for the reader to understand.[6]

```
320  REM     PRESENT VALUE ,P, OF A
330  REM     SERIES OF N PAYMENTS OF 1
340  REM     AT AN INTEREST RATE OF
350  REM     I PER PERIOD.
360  REM
370       LET P = (1-(1+I)↑(-N))/I
380 REM

320  REM     THE PRESENT VALUE ,V, OF A
330  REM     SINGLE PAYMENT OR 1 AT
340  REM     PERIOD N WITH AN INTEREST
350  REM     RATE OF I PER PERIOD
360  REM
370  REM     THE PRESENT VALUE, P, OF
380  REM     A SERIES OF N  PAYMENTS OF 1
390  REM     AT AN INTEREST RATE OF I PER PERIOD
400  REM
410       LET V = 1/(1+I)↑N
420       LET P = (1-V)/I
430 REM
```

Figure 6.

For readability reasons, use the LET in let statements, even when the implied LET is available. LET enhances readability, though implied LET is available on nearly all BASIC systems and saves program space.

Structured programming techniques suggest that unconditional GO TO statements never be used. We won't go quite *that* far, but will suggest that all GO TOs and GOSUBs go *down* the page as the program reads. In other words, always GO TO a line number larger than the line number where the GO TO appears. This applied to conditional GO TOs (IF THEN) and unconditional GO TOs.

There will be obvious exceptions to this rule, but try to follow it whenever possible. When possible, try to use FOR NEXT loops in place of IF THEN loops. They are easier to read and usually more time efficient. Do not have the program GO TO a statement that contains a REMark as there is a good chance that another user will delete the remark statement in an effort to save time and space.

One writer has suggested that since BASIC software is wrought with little bugs and inconsistencies (sometimes only apparent at distant decimal locations), avoid using the equals comparison (=) in IF THEN statements. If at all possible, use the less than (<) or greater than (>) comparison. This technique may save lots of debugging time.[2]

If BASIC allows it, try to indent nested IF THEN statements so they will appear as shown in Figure 7. This greatly enhances readability. For some reason, most BASIC systems do *not* permit this type of indent printing.

```
260 REM
270       IF A$ = "YES" THEN 310
280         IF B$ = "YES" THEN 310
290           IF C$ = "YES" THEN 310
300             GO TO 340
310
```

Figure 7.

Controlled FOR NEXT loops should be used whenever possible. They provide both style and reading ease. It should be possible to do all your "work" between the FOR and the NEXT statements. Therefore, do not exit to another part of the program between the FOR and NEXT statements except, perhaps, to GOSUB to a subroutine which will return to within the FOR NEXT loop. If you use nested FOR NEXT loops, indent your statements as shown in Figure 8.

```
200   REM     BUBBLE SORT
210   REM
220   FOR L=N TO 2 STEP -1
230   FOR I=1 TO L-1
240   IF D[I] <= D[I+1] THEN 290
250   LET X=D[I]
260   LET D[I]=D[I+1]
270   LET D[I+1]=X
280   REM
290   NEXT I
300   NEXT L
320   REM
```

Figure 8.

It is poor programming style and technique to exit a FOR NEXT loop with an IF THEN statement.

An exit to a subroutine from any point in a program is always permitted. Nevison calls a GOSUB an "officially approved absence," since a subroutine always returns to the next line following the statement from which it exited. Some stylists will recommend that the entire program be made up of small subroutines and very little main program. This suggestion represents the "epitome" of style and would not be incompatible with anything else stated in this article.

Most microcomputer systems do not include any matrix commands in BASIC. Thus, those writing programs for use by home computer readers, would help them by *not* using matrix commands. The same thing can always be done using a BASIC routine.

A MODULAR STYLE FOR BUILDING PROGRAMS

The introduction described earlier is the first module of a program. The remainder can be divided into similar modules or routines, each separated by a blank line or remark state-

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ment. Nevison would suggest that programs should always read from top to bottom in a smooth flow. Thus, the general design of most of your programs would likely look like this from top to bottom: Introduction, Data Entry Routine, Computation and Manipulation Routine(s), Output Routine(s), Subroutine(s), Data Statements. I suggest that all subroutines be located towards the end of the program; for instance, beginning at line 8000. That makes it easier to locate the subroutines and easy to alter them, if needed.

A well-designed program module will normally have only one entry point at its beginning and only one exit point at its end. All other "work" will be done between entry and exit. The one exception would be a mid-module exit to a subroutine which will return to the module and exit normally.

If the data entry routine includes entering data from a keyboard, it should be sure to prompt the user and tell him/her exactly what to enter. Do not expect the user to know how to respond to a simple question mark (?). It is much easier to have the program query, ENTER YOUR NAME ?. A good rule of thumb is to assume that the user has never before entered data from a computer terminal.

Data entry may also be simplified for the user by having the user only enter one item of data per prompt. Beginning computer users get very confused over requirements to enter data with commas (,) and quotation marks (").

```
240  PRINT "ENTER YOUR NAME AND PHONE NUMBER ";
250  INPUT N$,P$
300  PRINT "ENTER YOUR NAME";
310  INPUT N$
320  PRINT "ENTER YOUR PHONE NO.(XXX/XXX/XXXX)";
330  INPUT P$
```

Figure 9.

If data is located in DATA statements, these DATA statements should *all* be located in one location, preferably near the very end of the program, such as beginning in line 9000. They should be properly labeled with remark statements showing which data follows and in what sequence or format.

If data is located in a cassette or disk file, use a properly labeled subroutine to read from the file. Cassette and disk file read and write statements vary substantially from BASIC to BASIC. Placing all file read statements in a separate subroutine makes them much easier to locate and thus much easier to change for use on another computer system. The same use of subroutines is suggested for file writing statements.

If output routines include the use of PRINT USING statements, do all printing in properly labeled subroutines, as the syntax of PRINT USING varies from BASIC to BASIC. Placing all IMAGE statements together in one location will make them much easier to locate and modify all at once.

Some refinements and more details that may help you write non-published programs can be found in the references listed at the end of this article.

If you think of these rules *as* programs are being written, you will find them easier to use and the results will be clear, readable programs that readers will be encouraged to modify to meet their own needs. An example is shown in Figure 10.□

```
1000  REM  SORT, A NUMBER SORTING PROGRAM BY. J. BROWN,1978
1010  REM  MICROSOFT BASIC
1020  REM  FROM BASIC FOR HOME COMPUTERS
1030  REM
1040  REM  MODIFIED FOR HP2000 BASIC BY L. FINKEL,12/78
1050  REM
1060  REM  SORTS UP TO 50 NUMBERS ENTERED IN LINE 2030
1070  REM  INTO ASCENDING ORDER AND PRINTS THEM OUT.
1080  REM
1090  REM  CHANGE LINE 2030 TO INPUT X(Z) IF YOU WISH TO
1100  REM  ENTER NUMBERS FROM THE KEYBOARD
1110  REM
1120  REM  REM VARIABLES
1130  REM    X( )   LOCATION OF NUMBERS
1140  REM    Z,K,J  INDEX VARIABLES
1150  REM    N      LENGTH OF LIST
1160  REM    T      EXCHANGE VARIABLE
1170  REM
1180  REM     INITIALIZE
1190  REM
1200  DIM X[50]
1210  REM
1220  PRINT "HOW MANY NUMBERS TO BE SORTED";
1230  INPUT N
1240  PRINT
1250  REM
2000  REM     DATA ENTRY ROUTINE
2010  REM
2020  FOR Z=1 TO N
2030  READ X[Z]
2040  NEXT Z
2050  REM
3000  REM     PRINT UNSORTED LIST
3010  REM
3020  PRINT "UNSORTED NUMBERS"
3030  PRINT
3040  GOSUB 8020
3050  PRINT
3060  PRINT
3070  REM
4000  REM     SORT ROUTINE
4010  REM
4020  FOR K=1 TO N-1
4030  FOR J=K+1 TO N
4040  IF X[K] <= X[J] THEN 4080
4050  LET T=X[K]
4060  LET X[K]=X[J]
4070  LET X[J]=T
4080  NEXT J
4090  NEXT K
4100  REM
5000  REM     PRINT SORTED LIST
5010  REM
5020  PRINT "SORTED LIST"
5030  PRINT
5040  GOSUB 8020
5050  STOP
5060  REM
8000  REM     SUBROUTINE TO PRINT NUMBERS
8010  REM
8020  FOR Z=1 TO N
8030  PRINT X[Z];
8040  NEXT Z
8050  RETURN
8060  REM
9000  REM     DATA LIST
9010  REM
9020  DATA 98,14,60,18,16
9030  DATA 80,60,90,3,14
9040  DATA 78,104,13,12,12
9050  REM
9999  END
```

Figure 10.

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ABOUT THE AUTHOR

LeRoy Finkel has been operating behind the scenes in the personal computing market for over 10 years. He was a founder and early regular contributor to People's Computer Company *newspaper, now known as* Recreational Computing. *He has co-authored with Bob Albrecht and Jerald Brown, two popular beginners programming books published by John Wiley & Sons:* BASIC, 2nd Edition, *and* BASIC for Home Computers.

His personal computing activities are squeezed in between his normal job activities of teaching Business Education at San Carlos High School in San Carlos, California, teaching computer programming at DeAnza College and occasional courses taught for the extension division of the University of California, Berkeley.

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CIRCLE INQUIRY NO. 268

Disc Drive Timing Program

Disco-Tech announces DDT, a new disc drive timing program for both TRS-80 and Apple II microcomputers. DDT lets every disc drive owner keep track of his disc drive motor speed on a routine basis and to adjust it himself if it's running fast or slow. Fast- or slow-running disc drives cause data loss and incompatibility among diskettes. DDT reduces downtime and repairs.

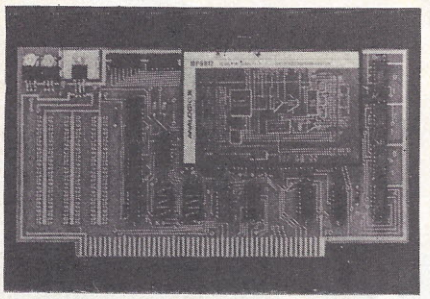
The DDT program works on any disc drive. It provides a real-time graphic display of disc drive motor speed on the video screen, which lets the user analyze the motor speed of each drive and adjust the speed within one-tenth of one RPM, out of an optimum 300 RPM.

The TRS-80 DDT program is $14.95 on cassette and $19.95 on diskette. The Apple version is available on diskette only at $19.95. For details contact Disco-Tech, P.O. Box 11129, Santa Rosa, CA 95406.

CIRCLE INQUIRY NO. 122

S-100 Converter Board

The Tecmar S-100 A/D board is designed for applications requiring high speed accurate analog to digital conversion including real time applications.



This board interfaces the Analog MP 6812 Complete Data Acquisition System to the S-100 bus. The board accepts 16 single-ended inputs and can be used to do analog to digital conversion for data throughputs up to 30 KHz with 12-bit accuracy.

For details contact Tecmar, Inc., 23414 Greenlawn Ave., Cleveland, OH 44122.

CIRCLE INQUIRY NO. 123

Support Workbook for Challenger 1P

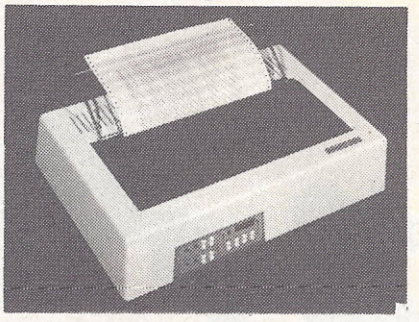
Total Information Services announces a workbook for the Ohio Scientific Challenger 1P. *Getting Started with Your Challenger 1P* introduces the fundamentals of C1P BASIC and explains its characteristics, limitations and useful features. This document discusses calculator and program mode, input and output, data representation, and program storage on cassette.

Price is $5.95 plus $1 p&h. For details contact TIS, P.O. Box 921, Los Alamos, NM 87544.

CIRCLE INQUIRY NO. 125

High-Speed Serial Printer

The Model DS180 is a new dot matrix serial printer offering high speed throughput. The unit prints at 180 cps using bidirectional, logic-seeking control of the carriage.



Under microprocessor control, the printhead automatically performs high speed tabs over blank space in the text and takes the optimum path to the next printable character.

For details contact Datasouth Computer Corp., 627 "F" Minuet Ln., Charlotte, NC 28210.

CIRCLE INQUIRY NO. 124

Data Entry/Display Terminal

Burr-Brown introduces a low cost microprocessor based terminal aimed at data collection, control and display applications in EDP and industrial systems.

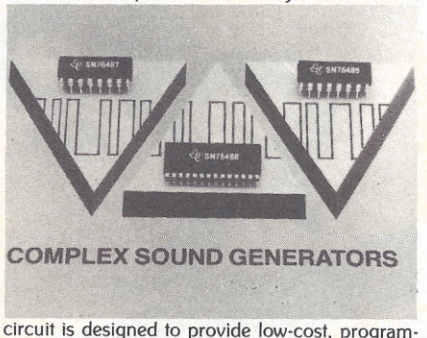
TM25 "Microterminal" is designed to provide simplified man/machine interface at a lower cost than full scale CRT and printing terminals and carries a one-year warranty.

For details contact Burr-Brown, International Airport Industrial Park, P.O. Box 11400, Tucson, AZ 85734.

CIRCLE INQUIRY NO. 126

Sound Generation Integrated Circuits

Three new complex sound generation integrated circuits have been announced by Texas Instruments. Two of circuits can be used separately or with a microprocessor-based system. The third



circuit is designed to provide low-cost, programmable tone and noise generation capability for microcomputer systems.

For details contact Texas Instruments Inc., P.O. Box 84, M/S 812, Sherman, TX 75090.

CIRCLE INQUIRY NO. 127

Accounting Package for Altos

P.S. Inc. announces a fully integrated accounting package that is now being run on the Altos.

The P.S. Accounting Package includes a General Ledger which allows the company to name and number over 1000 of its own accounts and to generate financial reports for the overall operation as well as any profit centers.

Tied into the General Ledger are Accounts Payable, with aging and cash requirements reporting; Accounts Receivable with aging and sales analysis; Order Entry and Inventory Control.

For more information call (701) 235-8145 or write P.S. Inc., 619 NP Ave., P.O. Box 2017, Fargo, ND 58107. Order toll free by calling (800) 437-4774.

CIRCLE INQUIRY NO. 128

Data Master General Ledger System

Data Master is a comprehensive general ledger system designed for use with the Micropolis computer. The system is written in BASIC and responds to menu/prompts.

The system also provides the user with instant trial balance as records are entered or updated, account number validation as journal records are entered, and automatic file open/close after every ten journal input transactions to prevent power failure loss of more than ten records. The chart of accounts is index sequential access method file type.

The Data Master system includes the floppy disk, trial chart of accounts and an installation/training manual. For more information contact Data Master, P.O. Box 88, Hamburg, IA 51640, (712) 382-2738.

CIRCLE INQUIRY NO. 129

Educational Authorware for TRS-80

MicroGnome's CAIWARE is a software system for authoring and using Computer Assisted Instruction on the 16K TRS-80 with Level II BASIC. The author is guided and prompted by a set of well-defined prototype questions.

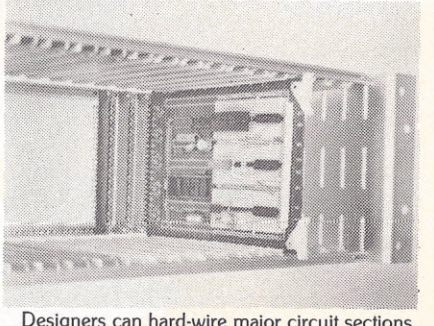
Questions are identified by subject, lesson, topic and number, and the question number may be entered by the author or automatically generated by the program. Text may be inserted between topics and may be identified in three levels of detail.

For details contact Fireside Computing, Inc., 5843 Montgomery Rd., Elkridge, MD 21227, (301) 796-4165.

CIRCLE INQUIRY NO. 130

Prototyping Breadboard Circuit Card

A new prototyping card, designed for easy circuit development in card-cage systems, includes areas for soldered and wrapped-wiring for permanent connections as well as patch-board terminal blocks for easy termination of leads or components that may vary.



Designers can hard-wire major circuit sections, insert the board into the system and develop final circuit configuration using the patch-board section.

For details contact Vector Electronic Co., Inc., 12460 Gladstone Ave., Sylmar, CA 91342.

CIRCLE INQUIRY NO. 131

Radio and Television Software

Solar Computer Systems Corporation announces a complete series of software programs of special interest to radio and television stations designed to run on Smoke Signal Broadcasting's Chieftan Systems.

Available programs include audience measurement, attitude research, music research, lifestyle surveys, ARBITRON analyses and more.

For details contact Solar Computer Systems Corp., 2360 43rd Ave. E., #308, Seattle, WA 98112, (206) 322-2241.

CIRCLE INQUIRY NO. 132

Text Editor for Apple

Apple Computer, Inc. announces the Apple Writer: an inexpensive text editor for the Apple II personal computer.

With the attachment of a dot matrix or impact-type printer and a television screen, the Apple II and Apple Writer become a time-saving tool for producing and revising documents.

A document needs to be typed into the computer only once; revisions or changes can be accomplished easily and quickly. Additional documents or document segments (e.g. paragraphs) can be merged into any location within the previously typed document.

For details contact Apple Computer, Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE INQUIRY NO. 133

DISK FIX

DISK FIX is a general purpose utility for MITS/Pertec disks which allows any sector of an unmounted diskette to be examined, edited and/or rewritten. The selected sectors are displayed in both decimal and controlled ASCII with all system overhead labeled (i.e., file number, check sum, next track and sector, etc.).

DISK FIX provides the alternative to reentering entire programs or data files lost due to "DISK I/O ERRORs" and "FILE LINK ERRORs".

Price is $95. For details contact The Software Store, Ltd., 706 Chippewa Sq., Marquette, MI 49855, (906) 228-7622.

CIRCLE INQUIRY NO. 134

Word Processing for Alpha Micro

Alpha Micro announces a new word processing system consisting of two components: a screen editor (AlphaVUE), and a text formatter (TXTFMT).

AlphaVUE is a high speed, two-dimensional editor, capable of editing large files by displaying one page at a time. Cursor positioning commands are used to move the cursor to any location on the screen to insert, delete, and replace characters, words or entire lines.

TXTFMT is used in conjunction with AlphaVUE to produce formatted documents. It takes the material edited by AlphaVUE and formats it according to instructions inserted into the text.

For details contact Alpha Micro, 17881 Sky Park North, Irvine, CA 92714, (714) 957-1404.

CIRCLE INQUIRY NO. 135

Free 'Story of Electronics'

The fall 1979 edition of Radio Shack's popular educational comic book, "The Science Fair Story of Electronics. . .the Discovery That Changed the World!" is now available for free distribution to schools, clubs, youth groups and interested individuals.

The 28-page full-color booklet, designed as a motivational learning aid for young people, focuses on topics such as magnetism, the development of "wireless" communications, TV, electronics in aviation and space exploration, and the computer age.

For details contact Radio Shack, 1300 One Tandy Center, Ft. Worth, TX 76102.

CIRCLE INQUIRY NO. 136

New Shugart Catalog

"The Headstrong Product Family" is the theme of a new catalog available from Shugart.

The six-page brochure provides comprehensive descriptions of their complete line of single- and double-sided 8" floppy and Minifloppy disk drives, the Winchester fixed disk drive series, and the recently introduced 8" Winchester drive series. Information includes listings of features, key specifications and photos for each product.

For details contact Shugart, 435 Oakmead Pkwy., Sunnyvale, CA 94086, Gary Yost.

CIRCLE INQUIRY NO. 137

PAGE Text Editor

The Interactive Information Systems PAGE Text Editor now supports the new DEC VT100 and VT132 terminal line. PAGE is available to users of DEC PDP-11 systems under the RSTS/E operating system. PAGE provides powerful features for the creation and editing of text used in correspondence, reports, documentation and other written materials.

PAGE allows easy location and modification (add, change, insert and delete) of characters, words, or entire sections of text. It also provides a fast search/find for embedded words or phrases.

The user can polish "first draft" text by utilizing commands for reformatting, indenting, paragraphing, tabbing, underlining, hyphenating, justifying, etc.

For details contact Interactive Information Systems, Inc., 10 Knollcrest Dr., Cincinnati, OH 45237, (513) 761-0132 or (800) 543-4613 outside Ohio.

CIRCLE INQUIRY NO. 139

WISE Brochure

The Wang Inter-System Exchange (WISE) is the subject of a new two-page brochure from Wang Laboratories. An intra-site electronic link for Wang's office information systems, WISE channels messages through coaxial cables from the workstations of one system to the components of another.

The brochure summarizes the applications and benefits of WISE. A schematic illustrates a WISE connected configuration.

For more information or to obtain a copy contact Wang Laboratories, Inc., One Industrial Way, Lowell, MA 01851, (617) 851-4111.

CIRCLE INQUIRY NO. 138

Software Turns TRS-80 into Printing Calculator

Manhattan Software's Calculator Plus offers printing calculator capabilities for the TRS-80 (Level II, 16K). The program also works as an on-screen calculator without a printer.

Calculator Plus provides chain and mixed calculations on screen, with a print command to record intermediate steps, if desired, and the final answer. Entries in long add-and-subtract operations can be checked with an on-screen review command, or printed out for verification and a permanent record. Works with printers down to Quick Printer II size.

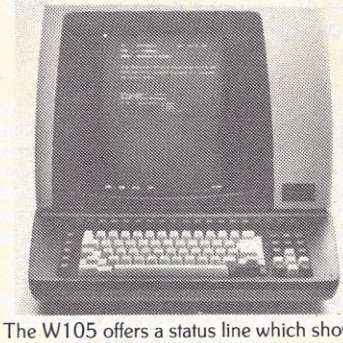
Significant figures can be retained in a separate memory section, with titles entered by the user for identification. Memories can be printed out as a table, or any memory can be carried to a calculation mode as a constant.

For more information contact Manhattan Software, Inc., P.O. Box 5200, Grand Central Station, New York, NY 10017.

CIRCLE INQUIRY NO. 140

Wordstream W105 Display

The Wordstream Systems Group of Basic Four Corporation introduced the W105 Display, a unit with several features designed to reduce input time and increase productivity of the Wordstream™ word processing system.



The W105 offers a status line which shows typing position, typamatic (automatic repeat) keys, operator-selectable automatic word wraparound, and an improved selectric-style keyboard for easier operator training and use.

The status line at the bottom of the display continuously shows diskette drive number, track number, line number and character position.

For details contact Wordstream Systems Group, Basic Four Corp., 300 E. 44 St., New York, NY 10017, (212) 557-3740, Peter Hermann.

CIRCLE INQUIRY NO. 141

Non-Impact Printer

Hewlett-Packard offers the Model 7310A high speed non-impact printer. It produces hardcopy forms, text, and graphics and is designed for use as a peripheral for HP's line of Model 2640 series graphic and alphanumeric terminals, Models 9825 and 9835 desktop computers and other HP systems.

Text printing is up to 500 lines per minute. A built-in paper cutter and stacker automatically trims paper to 8.5 x 11" and it can be programmed to cut page lengths any size from 2 to 20 inches.

For details contact Hewlett-Packard, 1501 Page Mills Rd., Palo Alto, CA 94304.

CIRCLE INQUIRY NO. 142

BASIC Compiler

BASIC II, an advanced BASIC compiler that is designed to exceed ANSI standards, is available on General Electric Information Services Company's (GEISCO) international Mark III computing service.

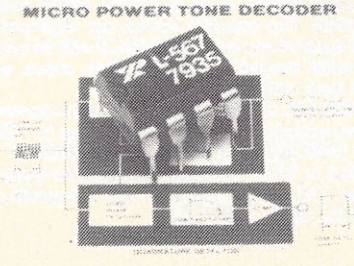
The new BASIC II compiler, more advanced than traditional BASIC, was developed by GEISCO to provide its Mark III Service customers with BASIC language that offers improved file handling, structured programming statements, external subroutines and other features that are attractive for financial, CPA and management reporting.

For details contact General Electric, 8150 Leesburg Pike, #510, Vienna, VA 22180.

CIRCLE INQUIRY NO. 143

Micro-Power Tone Decoder

The XR-L567 is a monolithic tone decoder integrated circuit that dissipates approximately one-tenth the power of conventional phase-locked loop (PLL) tone decoders.



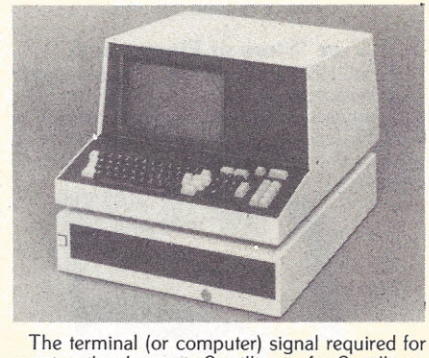
A micro-power version of the NE-567 tone decoder, the XR-L567 is designed for battery-operated tone decoding, remote control and telemetry applications.

For details contact Exar Integrated Systems, Inc., 750 Palomar Ave., Sunnyvale, CA 94086, (408) 732-7970, George Krautner.

CIRCLE INQUIRY NO. 144

Cash Drawers for Computer Terminals

Atlas Cash Drawers are being furnished to operate directly with computers and computer terminals for retail applications. This interface provides an economic alternative to the most advanced POS registers.



The terminal (or computer) signal required for opening the drawer is 2 milliwatts for 2 milliseconds. The signal voltage range is 2 to 28 VDC. Special circuits are available when necessary.

Prices range from $130 to $250 with interface circuitry. For details contact APG, Inc., 1601 67th Ave. N., Brooklyn Center, MN 55430.

CIRCLE INQUIRY NO. 145

Computerized Math

The Soft Warehouse has released its field-tested math program which enables users to solve such problems as polynomial multiplication, symbolic differentiation and integration, simplification of trigonometric expressions, and exact solutions of nonlinear equations.

The company is distributing the muMATH-79 software for 8080, 8085 and Z-80 based microcomputer systems using TRSDOS, standard CP/M, or upward-compatible operating systems such as Cromemco CDOS or Imsai IMDOS.

Users will receive fully documented source listings and interactive lessons. In addition, software updates and tutorials for one year are supplied in a regularly published newsletter.

For details contact The Soft Warehouse, P.O. Box 11174, Honolulu, HI 96828.

CIRCLE INQUIRY NO. 146

Translator Program

Percom Data Company is offering a translator program which converts files on soft-sectored minidiskettes for use with Percom LFD-400 hard-sectored mini-disk drive systems.

SOFTRAN™ is available in versions to convert files operating under mini FLEX, FLEX 2.0 and Smoke Signal Broadcasting's DOS. The significance of SOFTRAN is that it makes the Percom LFD-400 a universal mini-disk storage system.

For details contact Percom Data Co., 211 N. Kirby, Garland, TX 75042.

CIRCLE INQUIRY NO. 147

COBOL for 8080/Z-80

Lifeboat Associates has available CIS COBOL, a language system especially developed to speed the production of microcomputer applications software packages which require ISAM file management and good screen data handling.

CIS COBOL (standard) supports many features to level 2 including dynamic loading of COBOL modules and a full ISAM file facility. Also, program segmentation, interactive debug and powerful interactive extensions to support protected and unprotected CRT screen formatting from COBOL programs used with any dumb terminal.

Price is $850. For details contact Lifeboat Associates, 2248 Broadway, NY, NY 10024.

CIRCLE INQUIRY NO. 148

6809 Systems Software

Technical Systems Consultants offers software for the SWTPC 6809 system which includes a 6809 version of the FLEX disk operating system, a text editor, a resident assembler, a fast BASIC interpreter, and an assembly language debug package.

FLEX features include dynamic file allocation, random and sequential files, printer spooling, batch job type program entry, automatic space compression, user startup facility, and English error messages.

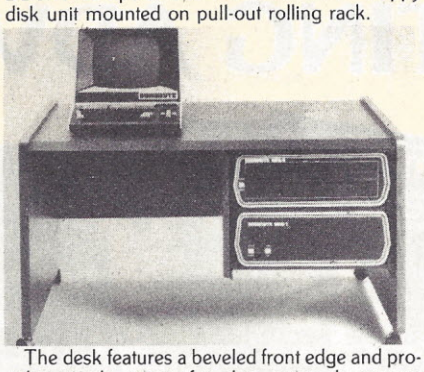
The text editor and assembler are included with the FLEX package but may be purchased separately. The BASIC is a very fast interpreter with features such as random access files via record I/O and virtual arrays, unlimited string length, two-dimensional arrays and a renumber facility. The debug package is capable of simulating all functions of the 6809 CPU including interrupts and I/O operations.

Contact Technical Systems Consultants, Inc., P.O. Box 2570, W. Lafayette, IN 47906.

CIRCLE INQUIRY NO. 151

Computer Desk

Dynabyte has available a new Command Center desk configuration designed to house the DB8/1 computer and DB8/4 dual 8" floppy disk unit mounted on pull-out rolling rack.



The desk features a beveled front edge and provides ample space for data entry documents and/or a printer. The unit is easily assembled and giant casters make the desk readily movable.

Contact Dynabyte Inc., 115 Independence Dr., Menlo Park, CA 94025, (415) 329-8021.

CIRCLE INQUIRY NO. 149

PC80 Instrumentation Interface

The PC80, designed for use with Radio Shack TRS-80 microcomputers, comes complete with power supply and bus interface connector and houses up to four special function circuit cards in any combination.

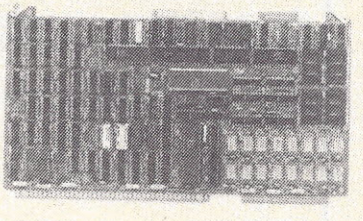
The cards presently available are: 32-differential channel A/D; 8-channel D/A; 2-channel Serial I/O for RS-232 or 20mA current loop; 48-bit parallel I/O; real time clock; floppy disk controller for both 5¼" and 8" drives; 2716 EPROM programmer; floating point arithmetic processor.

Contact Applied Micro Technology, Inc., P.O. Box 3042, Tucson, AZ 85702, (602) 795-9929.

CIRCLE INQUIRY NO. 150

16-bit Single Board Computer

The iSBC 86/12A™ 16-bit Single Board Computer is an enhanced, memory-expandable version of Intel's iSBC 86/12 board that allows the addition of two new memory modules. This expands the on-board dual port RAM from 32K



to 64K bytes and the on-board EPROM/ROM from 16K to 32K bytes.

Additional Multibus-compatible memory boards can be used to increase system memory to the full 1 megabyte supported by the 8086 CPU.

For details contact Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051, (408) 987-5020.

CIRCLE INQUIRY NO. 152

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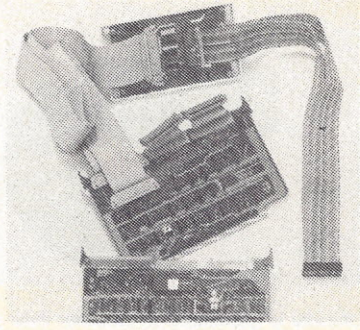
Support Products for MC6809

Motorola has several new system development products in support of the MC6809 microprocessor. Versions of the MC6809 EXORciser II and EXORterm 220 are the prime items offered, but six update packages are also offered to adapt a user's earlier EXORcisor I, IA or II systems to MC6809 system design.



These products enable designers to quickly and efficiently develop and debug any system centered around this newest 8-bit microprocessor.

For more information contact Motorola Semiconductor Products Inc., P.O. Box 20912, Phoenix, AZ 85036.

CIRCLE INQUIRY NO. 153

System Dynamics in Education

A new booklet "System Dynamics in Education" introduces teachers to one form of computer simulation to help them apply computers to traditional high school and college subjects.

The four-part booklet describes how system dynamics can be used to supplement and integrate biology, social sciences, mathematics and other subjects; discusses the DYNAMO simulation language which can simplify the teaching and use of simulation; provides several short examples of computer models applied to biology and other disciplines; and includes an annotated bibliography of materials appropriate for high school and undergraduate curricula.

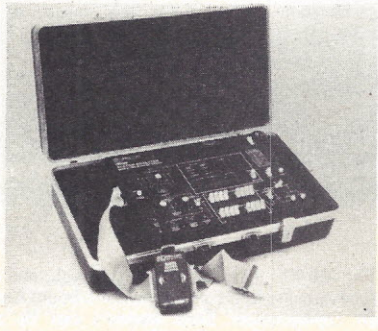
Journals and courses which can help teachers learn more about system dynamics are also listed.

Price is $1. Contact Pugh-Roberts Associates, 5 Lee St., Cambridge, MA 02139.

CIRCLE INQUIRY NO. 154

Z-80 and 8085 System Analyzers

Pro-Log's M824 (Z-80) and M825 (8085) system analyzers are self-contained portable units that connect easily to a system microprocessor via a single DIP clip or a low-profile plug-in connector. They provide a useful alternative or complement to software techniques for program development or debugging.



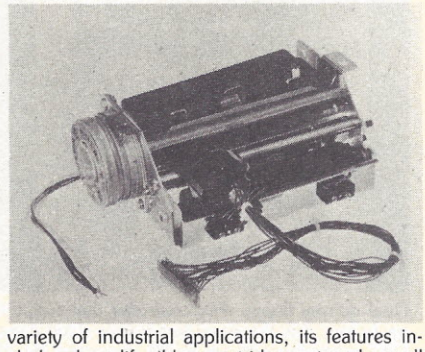
The two analyzers permit observation of microprocessor programs at normal speeds without program interference or in single steps: from breakpoint to breakpoint, instruction to instruction, or machine cycle to machine cycle.

For details contact Pro-Log, 2411 Garden Rd., Monterey, CA 93940, (408) 372-4593.

CIRCLE INQUIRY NO. 155

40-Column Impact Printer

Two-Day Corporation has a dot matrix printer mechanism which utilizes the same design techniques employed in its 80-column models. Designed for P.O.S. terminals, electronic cash registers, personal and small business computer systems, as well as for instrumentation and a variety of industrial applications, its features include a long-life ribbon cartridge, extemely small size, and high reliability.



Options include stepper-motor paper control, adjustable tractor-feed for continuous forms, and right-to-left printing. For details contact Two-Day Corp., 1915 W. Glenoaks Blvd., #102, Glendale, CA 91201.

CIRCLE INQUIRY NO. 156

Free MISCO Catalog

The Fall-Winter issue of the MISCO Minicomputer Supplies & Accessories Catalog is available now and offers many new products of interest to computer users nationwide.

Among the featured items are CRT tables and turntable, computer room anti-static products, media shippers and mailers, several additional storage units, and a filing system for flexible disks.

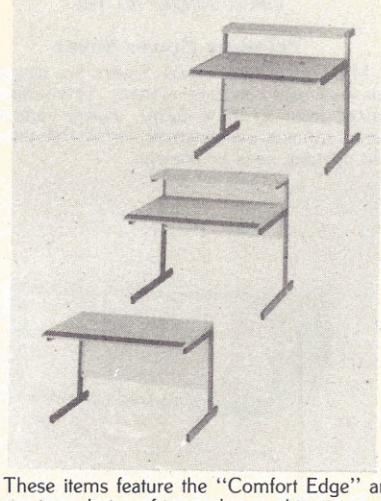
Misco Inc. offers a complete range of guaranteed, name-brand minicomputer media, supplies and accessories via direct mail catalog. A toll free telephone order number is provided, and fast mail order service is emphasized.

Available free. Contact Misco Inc., 963 Holmdel Rd., Box 399L, Holmdel, NJ 07733, (201) 946-3500.

CIRCLE INQUIRY NO. 157

Computer Furniture

Systems Furniture Company offers the "Secretary Height" Specialty I Data Desks, 26" high and 29" deep in either 36 or 48" widths. A third Data Desk, 48" wide, 35" deep and 28" high may be used separately or as a complement to the Specialty III Stand-Alone Electronic Bay.



These items feature the "Comfort Edge" and come in a choice of two color combinations: off-white top, walnut comfort edge, black legs and modesty panel or teak top with brown comfort edge and legs and champagne modesty panel.

For details contact Systems Furniture Co., 13900 S. Figueroa St., Los Angeles, CA 90061.

CIRCLE INQUIRY NO. 158

Program Runs Flex on SWTP

Percom Data Company is now offering a program which permits Flex 9.0 software to be run on SWTP 6800 systems that have been upgraded with a Percom Adapter module and PSYMON™ monitor for 6809 operation.

Called PSYCH-UP™, the program is supplied on minidiskette along with application instructions for $29.95. The PSYCH-UP program resolves all Flex incompatibilities without any hardware modifications.

For details contact Percom Data Co., Inc., 211 N. Kirby, Garland, TX 75042.

CIRCLE INQUIRY NO. 200

Bubble Memory

The Plessey PBM 80S Magnetic Bubble Memory Card provides 64K bytes of non-volatile memory for systems using the System 80 single board computer and the standard Multibus for memory and interface cards.

Up to 16K bytes in 128-byte blocks may be transferred at one time to and from the PBM 80S at rates up to 100K bytes/second via DMA. Software routines are supplied for formatting, reading and writing.

The soon to come higher capacity PBM 80M is also Multibus compatible. A single controller card can handle up to eight memory cards each containing 256K bytes of memory.

For details contact Plessey Microsystems, 19546 Clubhouse Rd., Gaithersburg, MD 20760.

CIRCLE INQUIRY NO. 201

Hands-On Micro Trainer

Integrated Computer Systems is offering the beginner-oriented, 8080A-based "Self-Study Microcomputer Software/Hardware Training Course."

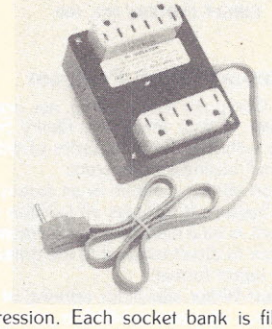
The course teaches both programming and hardware through careful explanation and hands-on exercises which students execute on the microcomputer included in the course.

For details contact Integrated Computer Systems, 3304 Pico Blvd., Santa Monica, CA 90405.

CIRCLE INQUIRY NO. 192

Power Isolator

Electronic Specialists has expanded its isolator line to prevent line hash and power surge problems such as crashes, memory loss and program glitches. Model ISO-2 comprises two filtered banks of 3-prong AC sockets with integral surge suppression. Each socket bank is filter isolated from the other bank and from the AC power line. ISO-2 is for microprocessor systems with limited processor-peripheral interaction problems.



For details contact Electronic Specialists, Inc., 171 S. Main St., Natick, MA 01760.

CIRCLE INQUIRY NO. 218

Overvoltage Protection

Computer Protection Systems prevent memory and transmission errors, lost data, electronic component failure and potential total destruction of electronic equipment caused by high voltage spikes and surges on the AC power line.

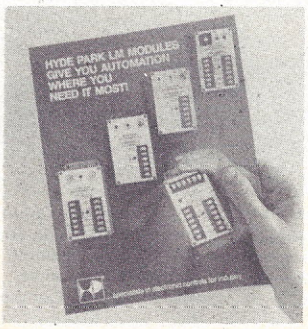
Designed to protect computers and other electronic equipment subjected to transient overvoltage surges created by lightning, startup and shutdown of equipment, power company load switching, arcing contactors and electrostatic discharge, CPS models can suppress voltage surges carrying as much as 300,000 watts of destructive energy.

For details contact Transtector Systems, P.O. Box 11159, Zephyr Cove, NV 89448, (800) 648-3387 (toll free).

CIRCLE INQUIRY NO. 159

Industrial Automation Guide

Helpful information is available to solve some of the costly control problems in a brochure "Hyde Park LM Modules Give You Automation Where You Need It Most." The complete LM series is a profitable system for improving line controls while also keeping within a small budget.



This new concept in electronic control systems features a power module and several basic logic modules which can be teamed together for a variety of applications.

For more information contact Hyde Park Electronics, 4547 Gateway Circle, Dayton, OH 45440, (513) 435-2121, Larry Tucker, Sales/Service Manager.

CIRCLE INQUIRY NO. 160

Report Writer Program

Sentinel Computer Corporation has added a Report Writer to their Interactive Query System (IQ) for use with their Sentinel series of database oriented small business computers.

The Report Writer program is an extension of the Query System. It includes all facilities of the Query as well as nine new types of statements that allow the user to direct retrieval to the printer and control the report format.

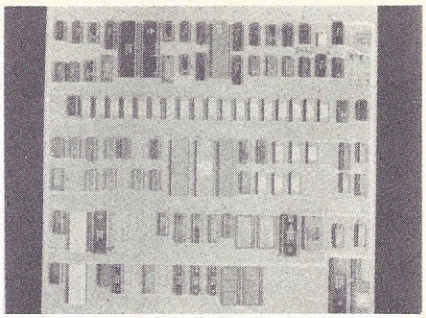
The Report Writer allows for retrieval of more comprehensive information which is presented in hard copy form. The user can generate a report through the IQ System for study at a later date.

For more information contact Sentinel Computer Corporation, 9902 Carver Road, Cincinnati, OH 45242.

CIRCLE INQUIRY NO. 163

SBC Supports Pascal

The TCB-85 is a single board microcomputer capable of supporting CP/M and Pascal. The functionally dense 64K board is compatible with Intel's Multibus and combines the following features in one package:



Dual density floppy disk controller that supports up to four disk drives or two double sided disks, CRT controller with up to 80 characters by 25 lines, RS-232 serial I/O port, parallel printer interface and strobed or scanned keyboard interface.

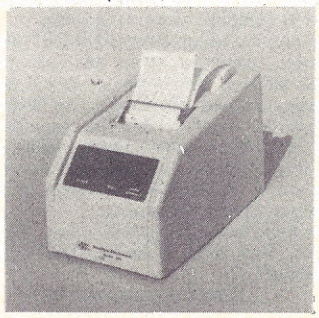
For details contact DOSC, Inc., 500 Fifth Ave., New York, NY 10033, (212) 398-9810.

CIRCLE INQUIRY NO. 161

Dot Matrix Impact Printer

The Model 100 is a 27 column dot matrix impact printer completely packaged to be used as a stand alone output printer.

The Model 100 incorporates the C.ITOH/ Epson Model 210 printer, the Interface Electronics



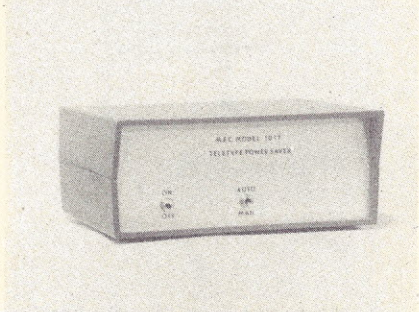
HIF-210 microprocessor based single board printer controller and modular power supply into a compact 6 x 6½ x 11" package. 5x7 dot matrix characters are printed with 27 columns per line at 2.4 lines per second.

For details contact Interface Electronic Div., Capitol Circuits Corp., 24 Denby Rd., Allston, MA 02134, (617) 787-2030.

CIRCLE INQUIRY NO. 162

Teletype Power Saver

M.E.C. Teletype Power Savers are designed for multi-user computer systems. Three models, priced from $145 to $250, enable night-time report running with automatic terminal shutdown. No operator need be present.



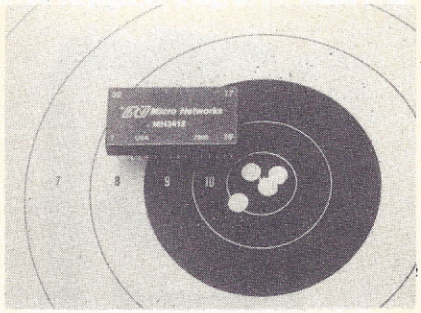
The T.P.S. is connected in series with the terminal and data source through standard DB 25 S connectors. Custom baud rates, sign off character strings and cables are available.

For details contact Charles Morrison, M.E.C., 3539 Lacon Rd., Hilliard, OH 43026.

CIRCLE INQUIRY NO. 164

Four Quadrant MDAC

The MN3412 is an accurate 12-bit Multiplying D/A that offers ± ½ LSB maximum gain error at +25 °C and gain drive of only 1 ppm/ °C over temperature.



Linearity is guaranteed to be better than ± ½ LSB over the full operating temperature range, insuring monotonicity. Settling time is specified to be less than 20 usec, and feedthrough is 80dB down at 400Hz.

For more information contact Micro Networks Corp., 324 Clark St., Worcester, MA 01606.

CIRCLE INQUIRY NO. 165

Super BASIC Enhancements

AM Jacquard has announced several major enhancements to its Super BASIC programming language, which is specifically used to program the company's J100 and J500 Videocomputers.

Included is a command, designed for communications-oriented programs, which enables users to request real time delays of specified durations. Another enhancement is an optional format which allows conformity to conventional European numeric notation through automatic replacement of decimal points with commas and commas with periods.

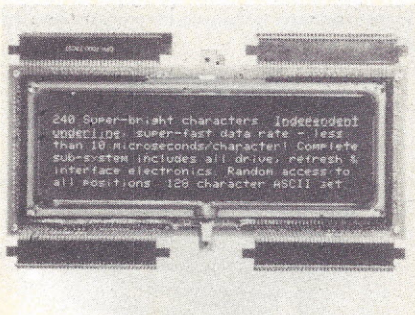
Super BASIC's error handling capability also has been enhanced with several commands designed to ensure greater flexibility in error situations. A new capability of the assembly language subprograms allows users to set error conditions before returning to BASIC.

For details contact AM International, 1900 Ave. of the Stars, Los Angeles, CA 90067.

CIRCLE INQUIRY NO. 166

Random Access Display Module

The M6400 Random Access Multi-line Display Module features vacuum fluorescent display technology of 6 lines of 40-character columns, 5x7 dot matrix with additional underline position for each character.



The M6400 includes all drive, refresh, and interface circuitry in a compact two PC board sandwich configuration. Data transfers can be accomplished in less than 10 microseconds per character on a continuous basis with no effect on the refresh cycle.

Price is $875 in 100 quantities. Delivery is 30 days ARO. For more information contact Digital Electronics Corp., 197 Airport Blvd., Burlingame, CA 94010, (415) 342-8333.

CIRCLE INQUIRY NO. 167

CPM-Compatible Operating System

A fully CPM-compatible operating system for the Radio Shack TRS-80 MOD-II Computer has been announced by MPU.

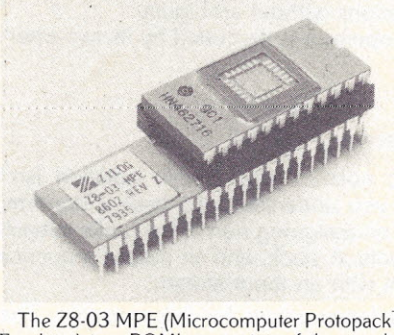
The new operating system will work with CBASIC and all other CP/M programs, requiring no changes to the operating codes. Source and object files will both work on the system, and programs from MPU and other CPM code-suppliers will be fully compatible.

For details contact MPU, P.O. Box 808, San Carlos, CA 94070, (800) 824-7888, Operator 883. In California (800) 852-7777.

CIRCLE INQUIRY NO. 168

Program Development Package

A unique packaging technique that simplifies program development during the prototyping stage by permitting economical program storage in separate EPROMs is offered in a new version of Zilog's Z8 single-chip microcomputer.



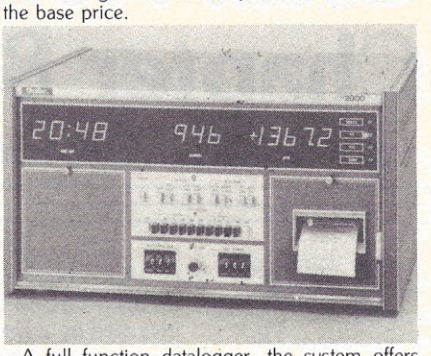
The Z8-03 MPE (Microcomputer Protopack™ Emulator) is a ROMless version of the standard Z8, designed for prototype development and pre-production of mask-programmed Z8-based applications.

For more information contact Zilog, 10340 Bubb Rd., Cupertino, CA 95014.

CIRCLE INQUIRY NO. 169

Data Acquisition System

The Datalogger 2000 BASIC System provides 40 channel capability in the mainframe with 20 channel scan card in the basic system and a signal conditioning module of the purchaser's choice in the base price.



A full function datalogger, the system offers microprocessing functions like signal processing, formatting, alarm assignment and interfacing.

For details contact United Systems Corp., 918 Woodley Rd., Dayton, OH 45403.

CIRCLE INQUIRY NO. 170

Communication Storage Unit

The Model 400 Communication Storage Unit adds data storage, editing and communication capability to distributed processing systems. The 400's Z80 microcomputing system performs comprehensive file management, forms entry and editing tasks. . .and, it handles the unit's communications protocol.

The 400 file management function uses a linked list file structure with simple, easily understood commands.

For details contact Columbia Data Products, Peripheral System Div., 9050 Red Branch Rd., Columbia, MD 21045, (301) 992-3400.

CIRCLE INQUIRY NO. 171

Programming Language System

tinyFORTH 2.1 is a computer programming language system consisting of a program cassette and user's manual. tinyFORTH is a version of the FORTH language tailored to TRS-80 computers.

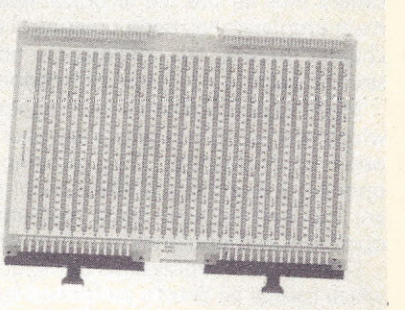
tinyFORTH is a high level structured language that provides an alternative to BASIC. The language is based on a memory resident dictionary of words. Each word is a small program. The user can readily expand the language by defining new words, limited only by available memory.

For details contact The Software Farm, P.O. Box 2304, Reston, VA 22090, (703) 437-9218.

CIRCLE INQUIRY NO. 172

Eurocard Wire-Wrap Boards

A new line of metric Eurocard Wire-Wrap boards are available in Series MPS, single size 100 x 160mm; Series DPS, dual size 233 x 160mm; and Series TMPS, triple size 366 x 220mm.



The new metric boards are supplied with single, dual or triple 96-position European right-angle wire-wrappable I/O connectors, available with either test point handles or ejector keys.

For details contact Garry Mfg. Co., 1010 Jersey Ave., New Brunswick, NJ 08902, (201) 545-2424, Harry Koppel, Exec. Vice President.

CIRCLE INQUIRY NO. 173

The Pascal Notebook Chapter 8

By Henry Davis, Associate Editor

In the first seven chapters of this series, a wide variety of topics has been covered ranging from formal language theory to dynamic storage alleviation. None of the code presented thus far has led to object code being produced. The main emphasis has been on control and data structures. This chapter breaks this orientation and considers instead a specific portion of Pascal-expressions.

Mathematics ordinarily uses a specific form of expressions which represents not only a series of operations, but also the order of evaluation. This ordering relys on parentheses, operator hierarchy and direction of evaluation. The first two are required because most mathematical expressions have operators and operands in infix order.

General infix expressions can specify an order of execution which cannot be directly performed by a computer because it is a strictly sequential machine. Fortunately, there is a technique to translate infix into a notation which is strictly sequential and can be used to generate an equivalent computer program.

Central to production code for an expression is the requirement that the expression be represented in an unambiguous manner that does not require parentheses to enforce operator hierarchy. The notation employed to satisfy these requirements is known as Reverse or Postfix Polish notation. It was invented by a Polish logician, J. Lukasiewicz, as a means of representing logic equations without ambiguity.

In this notation each operator is preceded by its two operands. For example:

A + B

becomes A B +

Translating algebraic notation into Polish notation isn't really too difficult after you understand the basic algorithm. The algorithm is based on assigning numerical ranks to each of the source text symbols. A stack, and an output sequence are used in conjunction with an input stream.

Table 9 details precedence values for this example. The algorithm can be stated as:

Initialize: Put a symbol with minimal precedence, "C" on the stack and a symbol with equal precedence, ")" on the end of the input expression.

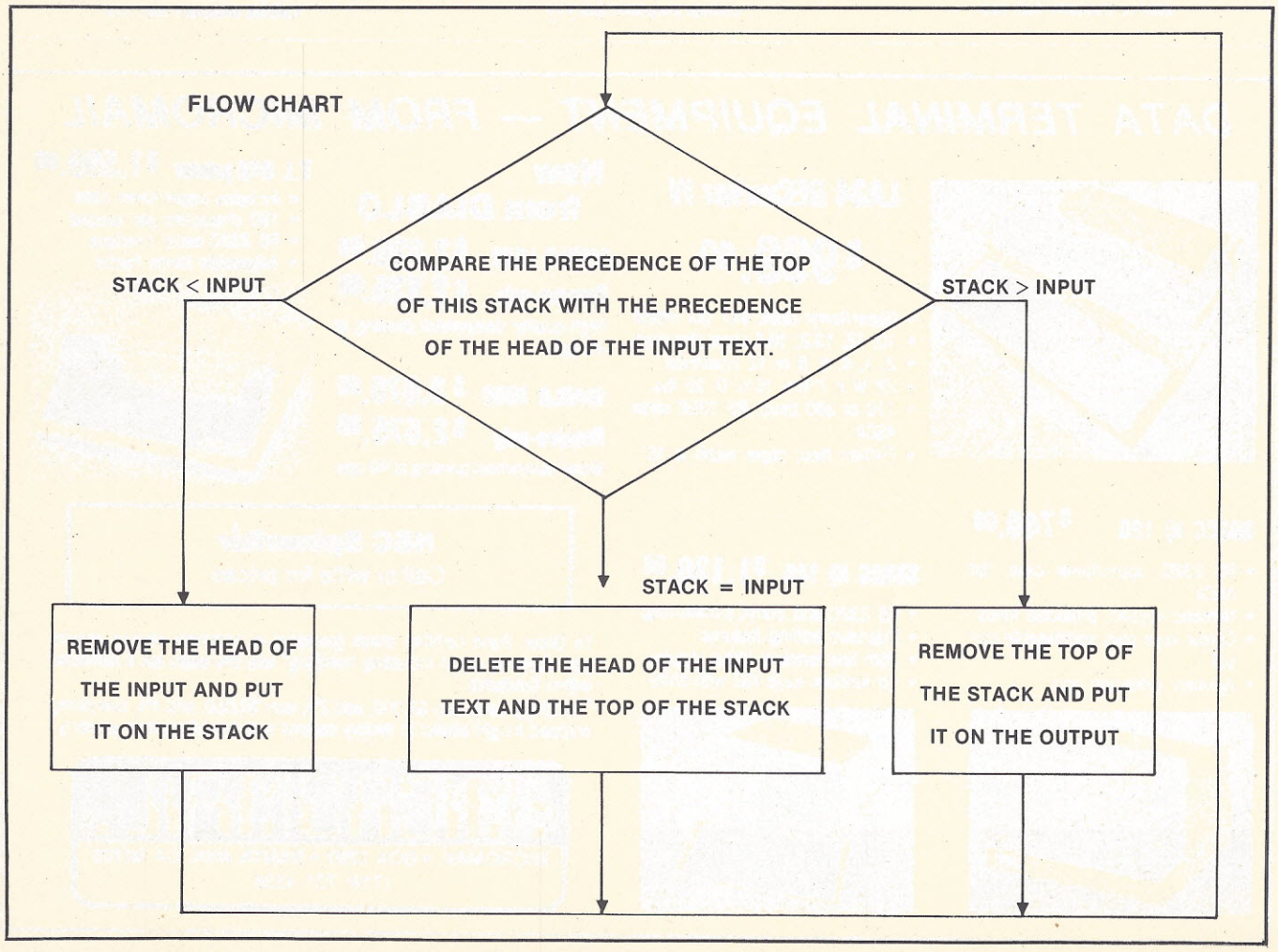


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Table 9.

Symbol	Top of Stack Precedence	Head of Input Precedence
+, 1	2	1
*, 1	4	3
A, B, ..., 2	6	5
(	0	7
)	–	0

Translation: Repeat the flow chart on page 118 until the input expression is empty.

What follows is a trace of the execution of this algorithm for the expression a + b * c — d.

Step #	INPUT TEXT	STACK	OUTPUT STRING
1	a + b * c — d		
2	a + b * c — d)	(	
3	+ b * c — d	a (	
4	b * c — d)	+ (	a
5	* c — d)	b + (	a
6	* c — d)	+ (	ab
7	c — d)	* + (	ab
8	— d)	(* + (	ab
9	— d)	* + (	abc
10	— d)	+ (	abc *
11	— d)	(	abc * +
12	d)	—	abc * +
13	)	(d —	abc * +
14	)	(—	abc * + d
15	)	(	abc * + d' —
16			abc * + d —

Execution of the output string proceeds from left to right as follows:

1. scan from left to right until the first operator is encountered.
2. perform the operation and store the result as a temporary value which replaces the three symbols.
3. continue scanning until the next operator is encountered and perform that operation.
4. continue as above until the final value is reached.

This evaluation proceeds as follows for the above example:

1. abc * + d—
2. A T_1 + d— where T_1 = b * c
3. T_2 d— where T_2 = T_1 + a
4. T_3 where T_3 = T_2 — d

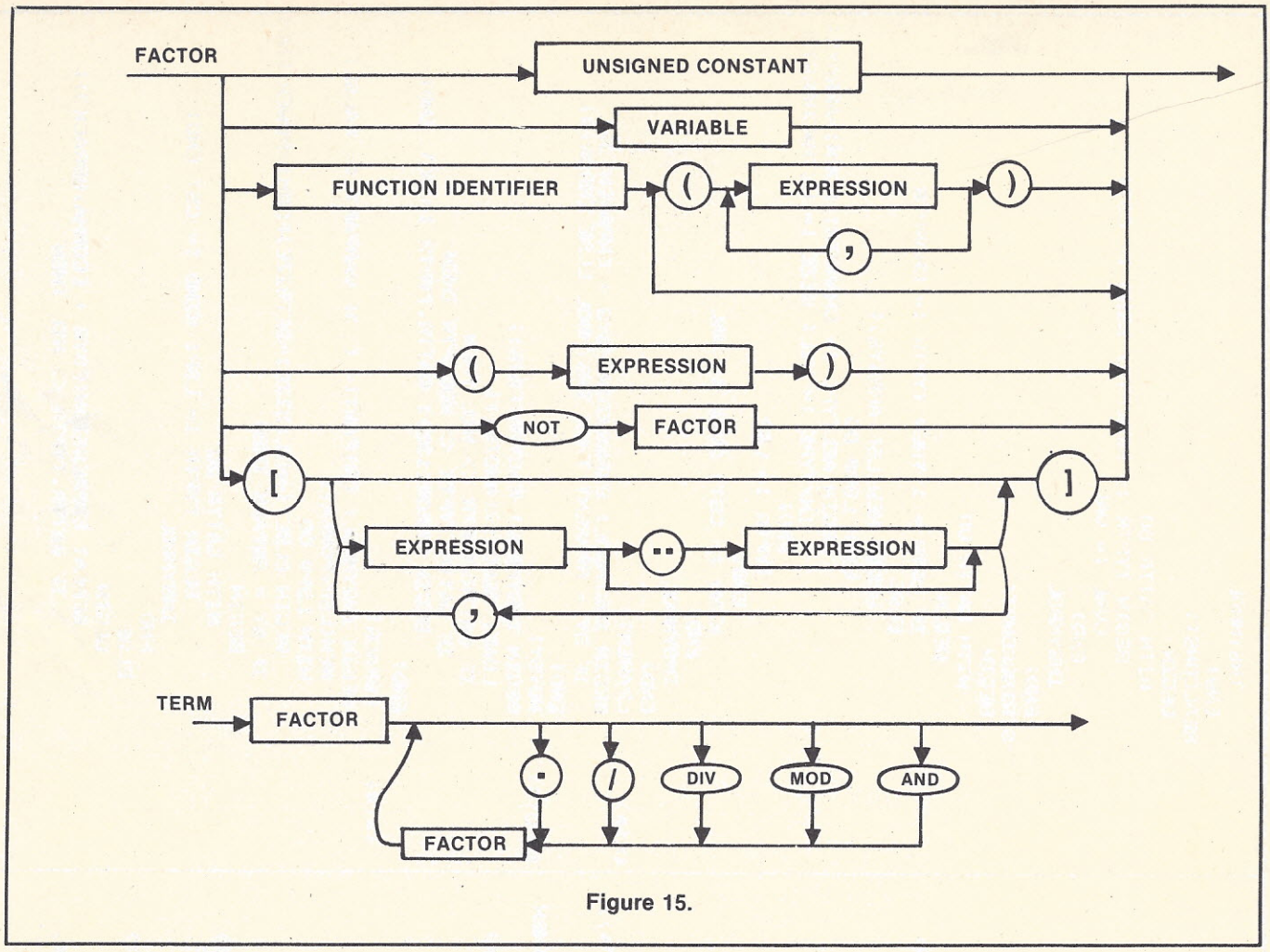

Figure 15.

In terms of actual assembly language, this can be written as follows in 9900 assembly code.

```
MOV  @B, R1          ; get b
MOV  @C, R2          ; and c into registers
BL   @MPYR           ; perform appropriate multiply
MOV  R3, @T1         ; put result in T1
MOV  @T1, R1         ; get T1
MOV  @A, R2          ; and a into registers
BL   CADD            ; perform appropriate add
MOV  R3, @T2         ; save result in T2
MOV  @d, R1          ; get T2
MOV  @T2, R2         ; and d into register
BL   @SUB            ; perform appropriate subtract
MOV  R3, CT3         ; save result
```

Several facts should be obvious from this short piece of program. First, three temporaries are not necessary; one would do. Second, an excessive number of moves is required and are redundant. Third, the registers are not used efficiently; there are sixteen registers in the 9900 yet only three were directly used. Solving these three problems is a nontrivial task and has yet to be solved to everyone's satisfaction.

The design of Pascal is pragmatic in nature and makes the analysis of a Pascal program easy for a compiler. Because the issues above are closely related to a given computer and not the general task of compilation, the P series of Pascal compilers written by Wirth and others generates code for a hypothetical machine (various companies have introduced hardware so the machine is no longer hypothetical).

The general approach is as follows:

```
LOAD a               ; push the value of a on stack
LOAD b               ; push the value of b on stack
LOAD c               ; push the value of c on stack
MPU                  ; replace top of stack with TOS*TOS—1
ADD                  ; replace TOS with TOS+TOS—1
LOAD d               ; push d on stack
SUB                  ; replace TOS with (TOS—1)—TOS
```

Note that the stack eliminates the need for register assignments or temporary variables since they are implicit in the stack structure. Also, no amount of tricky hand coding in this assembly language can be more efficient in terms of speed or memory.

Now we are able to consider some of the code generation for Pascal. The listing includes the semantic routines for TERM and FACTOR. Figure 15 illustrates the syntax diagrams for these two pieces of Pascal.

Skip down to the CASE statement in the TERM procedure of the program that follows. LOP defines the type of the operator. You can go back and look at the variable declarations to see the other definitions. Assuming the operator is multiply, control is transferred to the MUL: label. (ATTR. TYPTR refers to the type of one of the operands as does GATTR. TYPTR.)

Assuming that one of the operands is a REAL (the other legal type is INTEGER) the integer variable must be converted to a floating point (real) number. FLO and FLT are used to perform this operation in the P-machine. This is the object code. GENO is used to output the object code associated with the P-code mnemonic.

MPI performs integer multiplication while MPR performs real multiplication. The code generation scheme is as used in the preliminary stack machine example above. Try following other paths through the TERM and FACTOR routines; the task is difficult but rewarding.

Next month will end this series with an overview of where you can get Pascal and some details of the P-machine.□

Program follows

PROGRAM LISTING

```
        PROCEDURE TERM(FSYS: SETOFSYS);
          VAR LATTR: ATTR; LOP: OPERATOR;
BEGIN (*TERM*)
  FACTOR(FSYS + [MULOP]);
  WHILE SY = MULOP DO
          BEGIN LOAD; LATTR := GATTR; LOP := OP;
      INSYMBOL; FACTOR(FSYS + [MULOP]); LOAD;
      IF (LATTR.TYPTR <> NIL) AND (GATTR.TYPTR <> NIL) THEN
        CASE LOP OF
(***)       MUL: IF (LATTR.TYPTR=INTPTR)AND(GATTR.TYPTR=INTPTR)
                 THEN GEN0(15(*MPI*))
               ELSE
                 BEGIN
                   IF LATTR.TYPTR = INTPTR THEN
                     BEGIN GEN0(9(*FLO*))
                       LATTR.TYPTR := REALPTR
                     END
                   ELSE
                     IF GATTR.TYPTR = INTPTR THEN
                       BEGIN GEN0(10(*FLT*));
                         GATTR.TYPTR := REALPTR
                       END;
                   IF (LATTR.TYPTR = REALPTR)
                     AND(GATTR.TYPTR=REALPTR)THEN GEN0(16(*MRP*))
                   ELSE
                     IF(LATTR.TYPTR@.FORM=POWER)
                       AND COMPTYPES(LATTR.TYPTR,GATTR.TYPTR)THEN
                       GEN0(12(*INT*))
                     ELSE BEGIN ERROR(134);GATTR.TYPTR:=NIL END
                 END;
(*/*)       RDIV: BEGIN
                 IF GATTR.TYPTR = INTPTR THEN
                     BEGIN GEN0(10(*FLT*));
                     GATTR.TYPTR := REALPTR
                   END;
                 IF LATTR.TYPTR = INTPTR THEN
                   BEGIN GEN0(9(*FLO*));
                     LATTR.TYPTR := REALPTR
                   END;
                 IF (LATTR.TYPTR = REALPTR)
                   AND (GATTR.TYPTR=REALPTR)THEN GEN0(7(*DVR*))
                 ELSE BEGIN ERROR(134); GATTR.TYPTR := NIL END
               END;
(*DIV*)     IDIV: IF (LATTR.TYPTR = INTPTR)
                 AND (GATTR.TYPTR = INTPTR) THEN GEN0(6(*DVI*))
               ELSE BEGIN ERROR(134); GATTR.TYPTR := NIL END;
(*MOD*)     IMOD: IF (LATTR.TYPTR = INTPTR)
                 AND (GATTR.TYPTR = INTPTR) THEN GEN0(14(*MOD*))
               ELSE BEGIN ERROR(134); GATTR.TYPTR := NIL END;
                 INSYMBOL
               END;
             REALCONST:
               BEGIN
                 WITH GATTR DO
                   BEGIN TYPTR := REALPTR; KIND := CST;
                     CVAL := VAL
                   END;
                 INSYMBOL
               END;
             STRINGCONST:
               BEGIN
                 WITH GATTR DO
                   BEGIN
                     IF LGTH = 1 THEN TYPTR := CHARPTR
                     ELSE
                       BEGIN NEW(LSP,ARRAYS);
                         WITH LSP@ DO
                           BEGIN AELTYPE := CHARPTR; FORM:=ARRAYS;
                             INXTYPE := NIL; SIZE := LGTH*CHARSIZE
                           END;
                         TYPTR := LSP
                       END;
                     KIND := CST; CVAL := VAL
                   END;
                 INSYMBOL
               END;
(*(*)        LPARENT:
               BEGIN INSYMBOL; EXRESSION(FSYS + [RPARENT]);
                 IF SY = RPARENT THEN INSYMBOL ELSE ERROR(4)
               END;
(*NOT*)      NOTSY:
               BEGIN INSYMBOL; FACTPR(FSYS);
                 LOAD; GEN0(19(*NOT*));
                 IF GATTR.TYPTR <> NIL THEN
                   IF GATTR.TYPTR <> BOOLPTR THEN
                     BEGIN ERROR(135); GATTR.TYPTR := NIL END;
               END;
(*(*)        LBRACK:
               BEGIN INSYMBOL; CSTPART:= [ ]; VARPART := FALSE;
                 NEW(LSP,POWER);
                 WITH LSP@ DO
                   BEGIN ELSET:=NIL;SIZE:=SETSIZE;FORM:=POWER END;
                 IF SY = RBPACK THEN
                   BEGIN
                     WITH GATTR DO
                       BEGIN TYPTR := LSP; KIND := CST END;
                     INSYMBOL
                   END
                 ELSE
                   BEGIN
                     REPEAT EXPRESSION(FSYS + [COMMA,RBRACK]);
                       IF GATTR.TYPTR <> NIL THEN
```

```
(*AND*)      ANDOP:IF (LATTR.TYPTR = BOOLPTR)
                   AND (GATTR.TYPTR = BOOLPTR) THEN GEN0(4(*AND*))
                 ELSE BEGIN ERROR(134); GATTR.TYPTR := NIL END
          END (*CASE*)

      ELSE GATTR.TYPTR := NIL
    END (*WHILE*)
END (*TERM*) ;

PROCEDURE FACTOR(FSYS: SETOFSYS);
  VAR LCP: CTP; LVP: CSP; VARPART: BOOLEAN;
      CSTPART: SET OF 0..58; LSP: STP;
BEGIN
  IF NOT (SY IN FACBEGSYS) THEN
    BEGIN ERROR(58); SKIP(FSYS + FACBEGSYS);
      GATTR.TYPTR := NIL
    END;
  WHILE SY IN FACBEGSYS DO
    BEGIN
      CASE SY OF
(*ID*)     IDENT:
           BEGIN SEARCHID([KONST,VARS,FIELD,FUNC],LCP);
             INSYMBOL;
             IF LCP@.KLASS = FUNC THEN
               BEGIN CALL(FSYS,LCP);
                 WITH GATTR DO
                   BEGIN KIND := EXPR;
                     IF TYPTR <> NIL THEN
                       IF TYPTR@.FORM=SUBRANGE THEN
                         TYPTR := TYPTR@.RANGETYPE


                     END
                 END
               ELSE
                 IF LCP@.KLASS = KONST THEN
                   WITH GATTR, LCP@ DO
                     BEGIN TYPTR := IDTYPE; KIND := CSI;
                       CVAL := VALUES
                     END
                 ELSE
                   BEGIN SELECTOR(FSYS,LCP);
                     IF GATTR.TYPTR<>NIL THEN(*ELIM.SUBR.TYPES TO*)
                       WITH GATTR,TYPTR@ DO(*SIMPLIFY LATER TESTS*)
                         IF FORM = SUBRANGE THEN
                           TYPTR := RANGETYPE
                   END
           END;
(*CST)     INTCONST:
           BEGIN
             WITH GATTR DO
               BEGIN TYPTR := INTPTR; KIND := CST;
                 CVAL := VAL
               END;
```

```
             IF GATTR.TYPTR@.FORM <> SCALAR THEN
               BEGIN ERROR(136); GATTR.TYPTR := NIL END
             ELSE
               IF COMPTYES(LSP@.ELSET,GATTR.TYPTR) THEN
                 BEGIN
                   IF GATTR.KIND = CST THEN
                     IF (GATTR.CVAL.IVAL < SETLOW) OR
                       (GATTR.CVAL.IVAL > SETHIGH) THEN
                       ERROR(304)
                     ELSE
                       CSTPART := CSTPART+[GATTR.CVAL.IVAL]
                   ELSE
                     BEGIN LOAD;
                       IF NOT COMPTYPES(GATTR.TYPTR,INTPTR)
                       THEN GENOT(58(*ORD*),GATTR.TYPTR);
                       GEN0(23(*SGS*));
                       IF VARPART THEN GEN0(28(*UNI*))
                       ELSE VARPART := TRUE
                     END;
                   LSP@.ELSET := GATTR.TYPTR;
                   GATTR.TYPTR := LSP
                 END
               ELSE ERROR(137);
           TEST := SY <> COMMA;
           IF NOT TEST THEN INSYMBOL
         UNTIL TEST;
         IF SY = RBRACK THEN INSYMBOL ELSE ERROR(12)
       END;
     IF VARPART THEN
       BEGIN
         IF CSTPART <> [ ] THEN
           BEGIN NEW(LVP,PSET); LVP@.PVAL := CSTPART;
             LVP@.CCLASS := PSET;
             IF CSTPTRIX = CSTOCCMAX THEN ERROR(254)
             ELSE
               BEGIN CSTPTRIX := CSTPTRIX + 1;
                 CSTPTR[CSTPTRIX] := LVP;
                 GEN2(51(*LDC*),5,CSTPTRIX);
                 GEN0(28(*UNI*)); GATTR.KIND := EXPR
               END
           END
       END
     ELSE
       BEGIN NEW(LVP,PSET); LVP@.PVAL := CSTPART;
         LVP@.CCLASS := PSET;
                 GATTR.CVAL.VALP := LVP
               END
           END
       END (*CASE*) ;
       IF NOT (SY IN FSYS) THEN
         BEGIN ERROR(6); SKIP(FSYS + FACBEGSYS) END
     END (*WHILE*)
END (*FACTOR*) ;
```

Using and Building Micro-Based Systems

Chapter Two

By David Marca, Associate Editor

INTRODUCTION

Last month, the concepts of System Life Cycle were explored. Those past foundations will be used as a context in which to discuss system development methods. Before the tutorial formally begins, two extremely important points must be kept in mind.

The first is that there will never be only *one* system development methodology. Eventually, a methodology will evolve (probably in this decade) that will be able to address approximately half of most problems we are concerned with today. However, there will always be differences between problems.

These differences can be controlled to a certain degree, if we group the systems being built into classes having similar properties. Some examples of system classes are:

1. *Transaction driven* — functions of a system are performed based on the arrival and departure of data collections (e.g., payroll, accounts receivable, central billing, etc.)
2. *Data Structure Driven* — the functions of a system are performed based on the forms and organization of internal system data (e.g., compilers, database managers, interactive graphics systems)
3. *Event Driven* — the functions of a system are performed based on the occurrence of continuous real world events (e.g., guided missile control, air traffic control, machine shop control)

Since systems can be grouped into different classes, different methodologies can be developed to properly address the requirements and constraints which are typical for each system class. During this tutorial, we will be concentrating discussion to the most common class of systems in small businesses — transaction driven.

The second point concerns the people and the methodologies used to build systems. People's *attitudes* will be the major driving force in producing better systems in shorter periods of time. Others have pushed the methodologies into the spotlight, stating that people in the past have been doing things entirely wrong, and new methodologies are the only solution.

Those who can step away from the battle of "keep old ways" versus the "new wave of system building" should begin to realize the following:

1. People can think, be creative and solve problems.
2. Methodologies are a *mechanism* by which people's abilities are focussed and put into the best use.
3. People are limited in their capacity to understand more than seven (plus or minus two) ideas at one time. They cannot understand a complex system all at once, and therefore cannot build a complete working system off the top of their head.
4. Methodologies are a *mechanism* by which a system's complexity can be broken into understandable parts and tied together to form a unified whole.

In other words, both the people and the methodologies must work *together*. Both must exist in order to maximize progress. By the end of this tutorial, we should be able to better understand what a methodology must contain in order to develop transaction based systems.

WHAT MAKES A METHODOLOGY?

Before the issue of "what constitutes a methodology" is addressed, a definition of "methodology" should be given: A system development process (methodology) is a system that develops another system.[1]

This should not be a surprise. In fact, if viewed properly, the concept of a methodology as a system is compatible with our previous understanding of System Life Cycle:

> Such a development system (methodology) can be viewed as a process where each instance is continuously receiving requirements as inputs and producing specifications as outputs. In such a development system, *requirements* are those items that are desired or needed, and *specifications* are the results that realize those requirements; one engineer's (person's) requirements could be another engineer's (person's) specifications.[2]

Thus, requirements come into and specifications come out of each System Life Phase (Figure 1). This implies that a methodology must successfully take requirements and convert them into specifications during each of those phases.

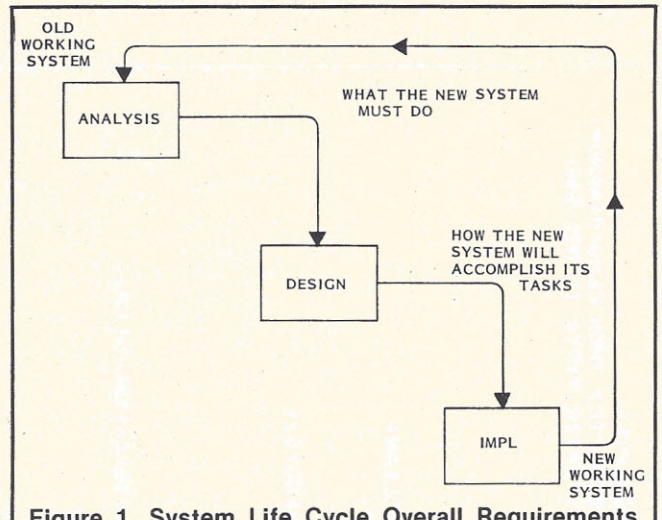

Figure 1. System Life Cycle Overall Requirements and Specifications.

We now have enough information to accurately define the components of a methodology. Clearly the items previously called "requirements" and "specifications" can be classified *Products* of a methodology. Just as in any discipline, people producing those products need *Tools* to build the products, and *Methods* describing how to use the tools. Finally, the most important component is a well-defined consistent *Framework*. This framework ensures the products produced in one System Life Cycle phase are *usable* in the next phase (Table 1).

The Framework component is the most important because it is the central controlling force which makes sure progress is being made each step of the way. It is, in fact, very similar to a project plan. The Framework is comprised of:

1. a Complete list of activities throughout the System Life Cycle,
2. the sequence in which these activities are performed,
3. the products used and produced by each defined activity, and

Table 1. Components of a Methodology

Component	Purpose
Framework	Ensures products are usable throughout the System Life Cycle.
Products	All organized forms of documentation, programs, and written procedures which describe (or are) different facets (or components) of a system.
Tools	Any graphic, written, or computerized languages, and automated/manual facilities used to build products.
Methods	Rules and guidelines specifying how the tools should be used to build products.

4. a defined purpose, viewpoint, and intended use of each product developed.

With all of the above properly defined, all system developers know exactly what goals must be achieved, and in what order they must be attained. Also, if a system development effort gets "off the track," the problem can be detected early, and hence corrected before a lot of effort is wasted.

PRODUCTS OF A SYSTEM DEVELOPMENT EFFORT

Our current view of System Life Cycle states there are three phases: Analysis, Design, and Implementation. As stated before, each phase uses "requirements" to produce "specifications." In general, each phase needs the following input as "requirements:" 1) functional requirements, 2) non-functional requirements, 3) system data descriptions, 4) constraints, 5) testing criteria, and 6) references.

Functional requirements state *what* the system will do. Non-functional requirements describe the frequency, duration and activation of the functions. System data descriptions offer views of data which complement descriptions of system functions. Constraints are any decisions made in the previous System Life phase that affects decisions made in system development activities in this phase. Testing criteria specify what must be done to ensure (within a certain confidence level) that the system will work.

For the Analysis Phase, the functional requirements needed are the descriptions of what the present system and its environment are doing. Similarly, non-functional requirements describe properties of the current system. Usually, these functional and non-functional requirements are specified in the analysis phase (see Chapter 1) because most systems in operation are inadequately documented.

Constraints given to the analysis phase define the scope and objectives of the development effort. The only type of testing criteria that may be specified is a list of problems that must be solved or functions to be added. The analysis phase cannot be considered complete until future system functions solve the stated problems or represent the desired new functions.

In design, the future system functional and non-functional requirements are needed from the analysis phase. System data descriptions, from analysis, must provide information about: 1) *user* data entities, and 2) relationships between those data entities. Design constraints consist of decisions specifying *how* some of the future system functions will be supported by the software or hardware (e.g., specific computer hardware, programming language, database manager). Testing criteria consists of descriptions detailing what constitutes an "acceptable" system to the user.

Implementation receives functional and non-functional requirements for each module to be coded. System data descriptions, from design, represent manual and automated databases. Implementation constraints are usually algorithms or portions of algorithms specified at design time. Testing criteria specifies how the modules, subsystems, and entire system will be checked out. This criteria is, in fact, actually the *designer's* acceptance criteria.

PRODUCT BUILDING TOOLS AND METHODS

During this discussion, we should always be conscious of the fact that tools form the basis of a system's *representation*:

> Of course, everyone recognizes that the stacks of paper generated during a (system development) process contain all the information we have available about the object (system). Yet, few people have specifically treated such *ad hoc* collections of information as a representation in the same way that an architect views graphical representations of a building.[3]

These different forms of representation reveal different and important aspects of a system. Within a well-defined framework (discussed earlier), these different representations are, in fact, *complementary* to each other.

While tools can provide an accurate representation of certain system aspects, they do little good without properly defined procedures describing their use. Just as it would be difficult to drive a spike using a screwdriver, it would be difficult to use a flowchart to describe a sunset. What is needed, therefore, are methods which use the right tool for the right job. We will take a look at some tools and methods which

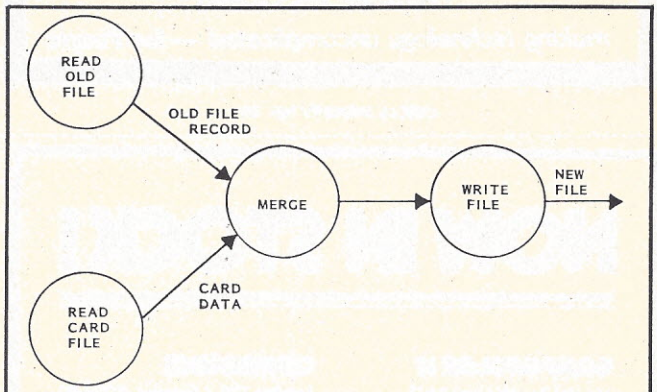

Figure 2. Example of a Data Flow Diagram.

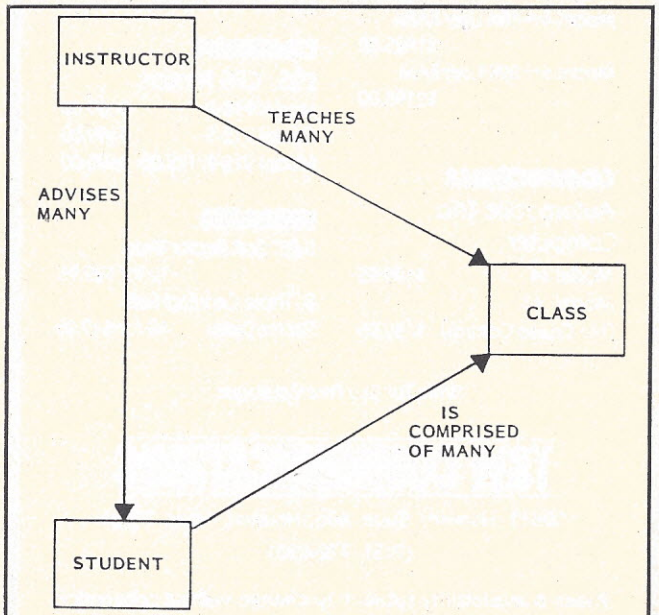

Figure 3. Example of a Bachman Diagram.

properly address system developer needs for each System Life Cycle phase.

For Analysis, at least four well-known methods and tools are being used: 1) PSL/PSA (Problem Statement Language/ Problem Statement Analyzer), 2) Data Flow Diagrams, 3) Bachman Diagrams, and 4) SADT* (Structured Analysis and Design Technique). PSL/PSA is an automated language and set of procedures capable of defining a system's data and changes of data into different forms.

Data Flow Diagrams (Figure 2) comprise a graphic language which can be used to describe functional requirements.[4] Bachman Diagrams are capable of describing system data entities and their relationships (Figure 3). SADT is both a graphic language and set of procedures which can describe functional requirements as well as system data entities and their relationships (Figure 4).[5]

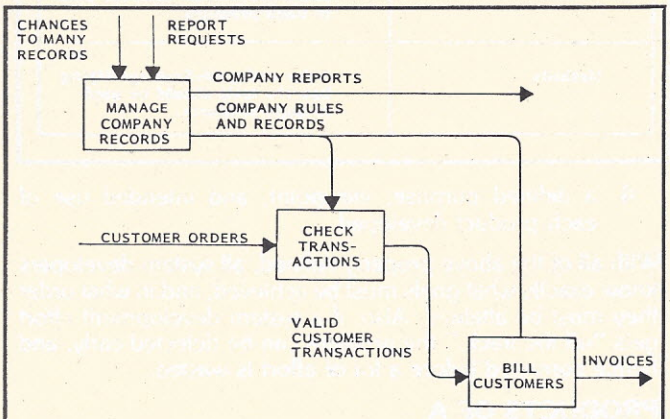

Figure 4. Example of an SADT Diagram.

SADT is also useful in Design for describing subsystem relationships and their structure. Other major design tools and methods are: 1) Jackson, 2) Constantine's Structure Design, 3) Warnier-Orr, and 4) HIPO (Hierarchical Input-Process-Output) Diagrams.

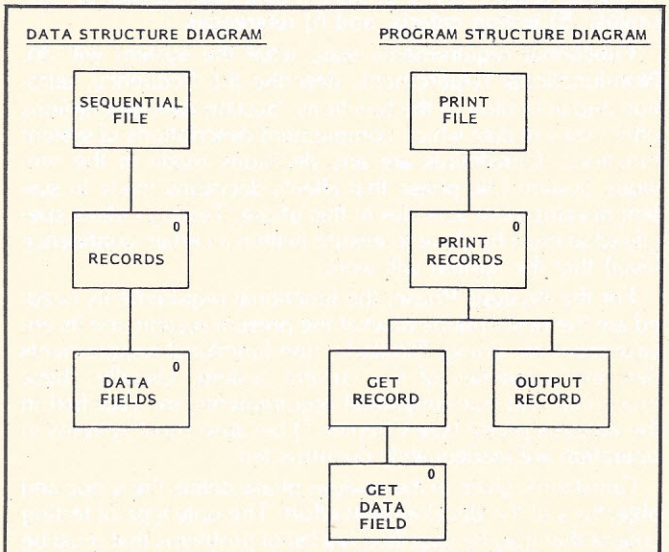

Figure 5. Example of Jackson Diagrams.

Jackson is a graphic language and set of procedures which can design programs given a problem data structure (Figure 5).[6] Constantine's Structured Design uses both a graphic language and procedures to arrive at a representation of a system's structure (Figure 6). Warnier-Orr has married the graphic language of Warnier Diagrams (Figure 7) with a set of procedures so that the sequential execution of software functions can be represented.[7] Lastly, HIPO diagrams can express a system's structure in a tree-like manner (Figure 8).[8]

*SADT is a trademark of SofTech

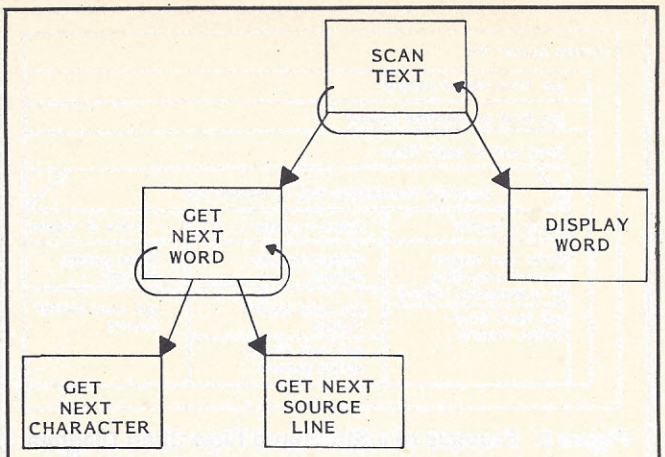

Figure 6. Example of a Structure Chart.

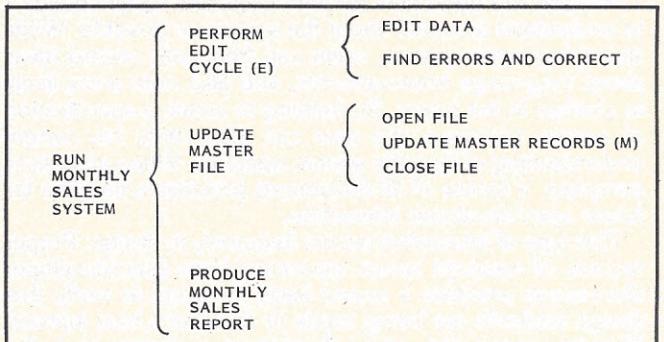

Figure 7. Example of a Warnier Diagram.

Some of these methods and tools (Jackson, Warnier-Orr, and HIPO) are useful not only in Design but also in Implementation. Nassi-Shneiderman Structured Flow Charts can also be used during implementation for describing program structure, and a set of procedures has also been developed to improve their usefulness (Figure 9).[9,10]

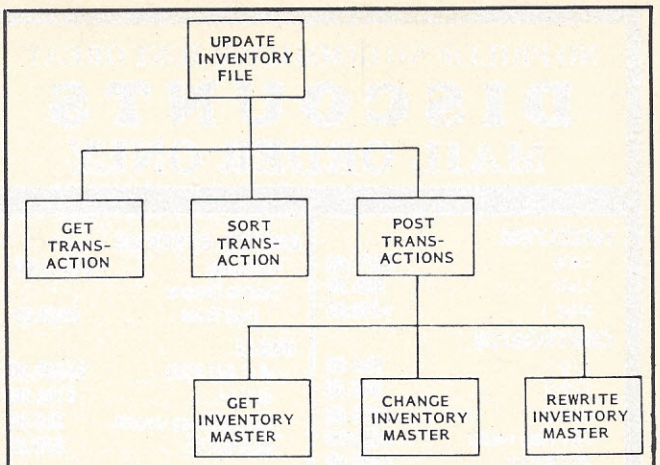

Figure 8. Example of a HIPO Diagram.

The classical flow chart is a very well known tool which is capable of describing the detailed operations of a program, and can therefore be used somewhat during this phase.

While we have taken the time to briefly mention some of the more common product building tools and methods, it is certainly too broad to address in any detail. The references will give you a start towards understanding those techniques and languages.

PROPER USE OF PRODUCTS

The standard uses of System Development Products have been briefly discussed. However, there are many other uses of these products besides just using them to define and develop a system.

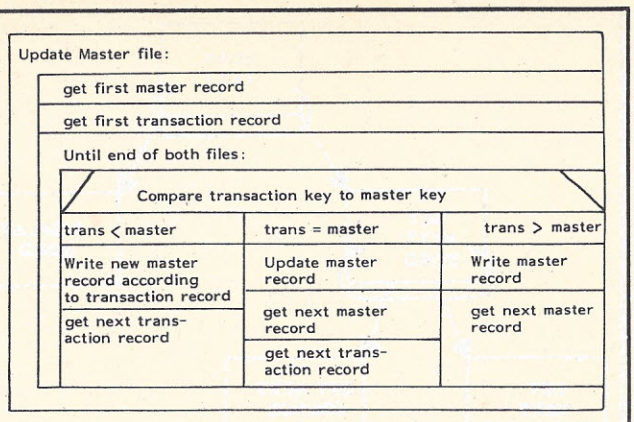

Figure 9. Example of a Structured Flow Chart Diagram.

Analysis is a good time for both users and system builders to understand as much about the system as possible. While specifying requirements, users can frequently record ideas about long-range improvements, and also note areas likely to change in the future. By helping to create a specification of system functions, the user can also verify his current understanding of how the system operates. When analysis is complete, a review of all documents provides a baseline for future user/developer interaction.

This type of interaction occurs frequently in design. Proper records of resolved issues stemming from user/developer discussions provides a sound basis for users to verify that design tradeoffs are being made to the user's best interest. This interaction also gives developers a chance to better understand the user's real needs.

Besides involvement with the user, the developer has an opportunity to perform research on critical performance areas, given good design representations. Once design is finished, a review of the design document will provide a firm baseline for discussions between designers and implementers.

During implementation, a good design document that has been reviewed can provide a "big picture" to the coders of software modules. When the software and hardware are operational, parallel testing of the automated products can both track down software errors and satisfy user acceptance

NEXT MONTH

In the next article, we will use two tools mentioned in this tutorial session (HIPO and Nassi-Shneiderman Structured Flow Charts) to represent the structure of FORTRAN programs. We will also begin to discover what the FORTRAN language is all about.□

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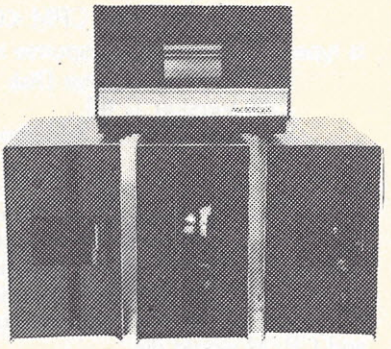

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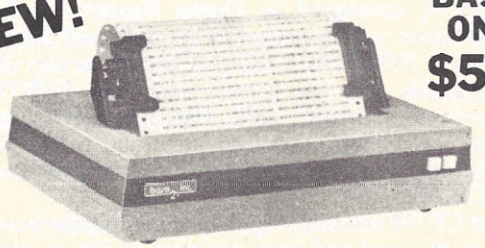

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Double Density for CP/M Lifeboat's North Star Version

Review by Alan R. Miller, Software Editor

CP/M is a powerful 8080/Z-80 operating system containing many of the features found on large mainframe computers. CP/M, developed by Digital Research in Pacific Grove, California, was reviewed in the July and December 1978 issues of INTERFACE AGE. A large selection of software is available for this system, including FORTRAN, several versions of BASIC, APL, Pascal, ALGOL, several assemblers, text editors, text formatters and a line printer spooler. Several of these have been previously reviewed in INTERFACE AGE.

Standard CP/M software is generally compatible from one computer to the next and from one type of disk to another. Thus a program that runs on an 8080 with a 5-inch floppy disk will also generally run on a Z-80 with a Winchester hard disk. There are a few exceptions, however.

Software such as APL and ALGOL and Xitan products require a Z-80 microprocessor. Also, the Radio Shack TRS-80 requires a special assembly of object programs. This is because the usual location of 100 HEX is not available.

FLOPPY DISKS

Two popular floppy disk formats are the 8-inch soft sectored and the 5-inch hard sectored. The 8-inch disk is formatted as 77 tracks, with 26 sectors per track. There are 128 bytes of data per sector in single density format and 256 bytes in double density.

One type of 5-inch disk is formatted with 35 tracks. Each track is divided into ten sectors. These sectors contain 256 bytes of data in single density, and 512 bytes in double density.

THE NORTH STAR DISK

The North Star floppy disk system uses the 5-inch, 35-track, 10-sector format. A controller board handles data transfer between the disk and the computer bus. Memory-mapped input/output (I/O) instructions (such as STA and MOV M,A) are used rather than the regular I/O instruction (such as IN and OUT).

Part of the disk-controller software resides in PROM located on the disk-controller board. The remainder of the software is located in read/write memory starting at 2000 HEX. This latter part is located right in the middle of the CP/M user area, and could be a source of trouble.

The Lifeboat version of CP/M solves this problem by effectively relocating this section of the software to a higher portion of memory.

GETTING CP/M UP FOR THE FIRST TIME

Before CP/M can be operational on any computer, the interfacing software must be written. The necessary routines must be specifically tailored to the computer. These routines must include instructions for the disk operations including the selection of the desired track and sector. Also, the drivers for the system console, the line printer, the punch, and the reader must be provided.

The interfacing software may also include additional features such as the initialization of I/O ports and the actual mapping of the four logical I/O devices into 16 physical devices. It would be a difficult task to write these necessary interface routines without the benefit of a computer. Fortunately, with the Lifeboat double-density version, this phase is extremely easy.

The user starts the initialization by bringing up the standard North Star double-density disk operating system (DOS). CP/M files are not generally compatible with the North Star operating system. But the Lifeboat CP/M version has a special file that can be executed by the North Star DOS.

The CP/M diskette is placed into CP/M drive A (North Star drive 1) and the command:

GO CPM <CR>

is typed. The welcome response is:

```
CP/M on North Star Disk
22K Version 1. 44
Copyright (C) 1979 Lifeboat Associates
A>
```

CP/M is up.

There is one small catch, though. This first version of CP/M utilizes the I/O routines from the North Star DOS located at 2900 HEX. This code is located right in the middle of the CP/M user area. If a large program such as disk BASIC were to be run, the I/O routines would be overlaid, and CP/M would die.

SECOND GENERATION CP/M

The next step is to obtain a proper set of I/O routines higher up in memory. A Lifeboat program called CONFIG will help with this task. Load it with the system debugger DDT:

A>DDT CONFIG.COM

This step works because DDT relocates itself above the DOS I/O routines at 2900 HEX then loads CONFIG below them.

A choice of 12 standard preprogrammed terminal arrangements are provided. These include variations for the Altair, Imsai, Processor Tech, Compal, Xitan, North Star and Vector Graphic systems. The assembly language listing for each version is given in the user manual. If one of these sets is correct, or almost so, then it can be loaded.

The desired routine is selected by patching CONFIG at address 120 HEX. The S (for SET) command in DDT is used for this purpose. Also locations 104 and 105 are patched with address 38 HEX, the return address of DDT. This will cause the computer to return to DDT at the conclusion of each step of CONFIG.

Branching to address 106 with the DDT command:

G106

loads the chosen routine. Control returns to DDT after the load. At this time DDT can be used to make any necessary alterations. If none of the given routines can be used, it will be necessary to write the I/O drivers from the beginning using the A (for assemble) command of DDT.

CONFIG is executed again when the I/O routines are in their desired form. A branch is made to address 109 HEX for this purpose. This second execution moves the I/O routines to the proper operating position (5B00 HEX in this case). CP/M is now actually using the routines.

If there is an error in the I/O routines, especially in the initialization routines, the system may die. On the other hand, if everything is OK, a working system is ready to be saved on disk. In this case, type:

SAVEUSR

and the new I/O routines will be written to the diskette in drive A. A final test of this new version should be performed. Do a hardware reset and branch to address E800 HEX to perform a cold start. If this works, you have a real operating

version of CP/M. (Note that E900 HEX is not a cold-boot address as it was in the single density version.)

ENLARGING THE SYSTEM

The CP/M system should be enlarged beyond 22K bytes to take advantage of all available memory. Choose a system size that is 2K bytes smaller than the memory. For example, if contiguous memory goes from zero to DFFF HEX, then CP/M can be enlarged to 52K bytes.

OTHER ROUTINES

Additional routines on the Lifeboat diskette free the user completely from the North Star DOS. These are:

FORMAT	Initialize single or double density diskettes
SAVEUSER	Write current system from memory to disk
COPY	Copies the system, or data or both from one diskette to another
DENSITY	Select single or double density mode

This latter program is particularly helpful when the user is converting from single density to double. One drive can be selected as single density and is used for the source. Another is selected as double density and becomes the destination drive. Then PIP can be used to copy all files from the older single density diskette to the new double:

PIP B:=C:*.*[V]

If only one drive is available, the DENSITY program can still be used to convert single density diskettes to double. By changing one byte in CP/M and executing DENSITY, the system will be configured as double density on logical drive A and as single density on logical drive B.

A SAMPLE USER ROUTINE

If there are other peripherals besides the console, then the user routine may be further altered. For example, if a line printer is available, then a separate routine should be included for it. Typing a Control-P will send the output to the list device as well as to the console.

Furthermore, PIP can be used to list disk files on the line printer with the command:

PIP LST:=<disk filename>

Listing 1 gives an example of a set of user routines. Provisions are made for a video console, a line printer, a telephone modem (for communication with another computer), and a Computime clock. The serial and parallel I/O ports are initialized on each cold and warm start.

The IOBYTE at memory address 4 is sampled to see whether console output is to be sent to the physical console or to the line printer. This can be a useful feature when programming in Microsoft BASIC. A BASIC program can be written and debugged on the video console. Then a hard copy can be obtained on the line printer with the command:

LPRINT

Now, by poking the IOBYTE from a value of zero to a value of 1, the BASIC PRINT command will send output to the line printer:

```
POKE 3,1
RUN
```

At the conclusion of the run, the IOBYTE can be poked back:

```
POKE 3,0
```

ENLARGING THE USER AREA

If the 256-byte user area is not large enough to contain all of the I/O routines, it can be enlarged to over 1K bytes. This space might be needed to map up to the maximum of 16 physical I/O devices. Also, interrupt service routines and time-of-day software can be included. Easy entry can be obtained by including additional jumps in the list at the start of the user area (at address DB15 in Listing 1).

```
START:  JMP   INIT     ;INITIALIZATION
        JMP   CONST    ;CONSOLE STATUS
        JMP   CONIN    ;CONSOLE INPUT
        JMP   CONOUT   ;CONSOLE OUTPUT
        JMP   LOUT     ;LIST OUTPUT
        JMP   PUNCH
        JMP   READR    ;READER INPUT

        JMP   TIME     ;EXTRA ENTRY
```

The user manual describes the method for enlarging the user area. The last 1K bytes of contiguous memory is normally designated as a buffer area. If the buffer area is moved somewhere else, then the user area can be expanded.

The North Star PROMs occupy the region of memory from E800 to EBFF HEX. Consequently, E7FF HEX is the highest memory location that can be used by CP/M. This means that the region from EC00 to FFFF HEX can be used for the 1K buffer.

CONCLUSION

The Lifeboat double-density CP/M version is definitely people oriented. It is extremely easy to use. Most of the system routines lead the user through the steps very carefully and thoroughly. Verification is required at each step.

Although the 5-inch disks are cheaper than the 8-inch disks, they have a much smaller capacity. This has been a serious disadvantage for the single-density format. But the double density 5-inch disk can store 163K bytes of CP/M programs. This larger size, coupled with the Lifeboat software, makes a minidisk package hard to beat.□ **Program follows**

PROGRAM LISTING

```
DATE 10/04/79  TIME 20:58:26
CP/M MACRØ ASSEM 2.0    #001    LIFEBØAT DØUBLE DENSITY BIØS

                        TITLE   'LIFEBØAT DØUBLE DENSITY BIØS'
                ;
                ; PRØGRAMMED FØR AN 8080/Z-80 MICRØPRØCESSØR
                ; BY ALAN R. MILLER
                ; NEW MEXICØ TECH, SØCØRRØ, NM  87801
                ; 505-835-5619          ØCTØBER 2, 1979
                ;
                ; TERMINAL DEVICES SUPPØRTED:
                ;
                ;  CØNSØLE      10 HEX  CØN:
                ;  LIST         12 HEX  LST:
                ;  PHØNE MØDEM  14 HEX  PUN:
                ;
0036 =          MSIZE   EQU     54      ;DECIMAL K
D600 =          BIØS    EQU     MSIZE*1024-200H
DB00 =          USER    EQU     BIØS+500H
4900 =          ØFFSET  EQU     1F00H-BIØS
0003 =          IØBYTE  EQU     3
000D =          CR      EQU     0DH     ;CARRIAGE RET
000A =          LF      EQU     0AH     ;LINEFEED
000C =          FFEED   EQU     12      ;FØRMFEED
                ;
0000 =          FALSE   EQU     0
FFFF =          TRUE    EQU     NØT FALSE
                ;
DB00            ØRG     USER
                ;
0010 =          CSTAT   EQU     10H
0011 =          CDATA   EQU     CSTAT+1
0001 =          CIMSK   EQU     1
0002 =          CØMSK   EQU     2
0012 =          LSTAT   EQU     12H
0013 =          LDATA   EQU     LSTAT+1
0001 =          LIMSK   EQU     1
0002 =          LØMSK   EQU     2
0014 =          MSTAT   EQU     14H     ;MØDEM
0015 =          MDATA   EQU     MSTAT+1
0040 =          MIMSK   EQU     40H
0080 =          MØMSK   EQU     80H
                ;
00C4 =          ADATA   EQU     0C4H    ;CLØCK
00C5 =          AC0NT   EQU     ADATA+1 ; PØRTS
00C6 =          BDATA   EQU     ADATA+2
00C7 =          BC0NT   EQU     ADATA+3
                ;
                START:
DB00 C315DB             JMP     INIT    ;INITIALIZATIØN
DB03 C33CDB             JMP     CØNST   ;CØNSØLE STATUS
DB06 C344DB             JMP     CØNIN   ;CØNSØLE INPUT
DB09 C350DB             JMP     CØNØUT  ;CØNSØLE ØUTPUT
DB0C C364DB             JMP     LØUT    ;LIST ØUTPUT
DB0F C37EDB             JMP     PUNCH
DB12 C344DB             JMP     CØNIN   ;FØR READER
                ;
                ; INITIALIZATIØN RØUTINES
                ;
DB15 3E03       INIT:   MVI     A,3
DB17 D310               ØUT     CSTAT   ;SETUP
DB19 D312               ØUT     LSTAT   ;INTERFACE
DB1B 3E15               MVI     A,15H   ;1 STØP BIT
DB1D D310               ØUT     CSTAT
DB1F 3E11               MVI     A,11H   ;2 STØP BITS
DB21 D312               ØUT     LSTAT
DB23 AF                 XRA     A
DB24 320300             STA     IØBYTE
                ;
                ; CØMPUTIME BØARD INITIALIZATIØN
                ;
DB27 D3C5               ØUT     AC0NT
DB29 D3C7               ØUT     BC0NT
DB2B 3E70               MVI     A,70H
DB2D D3C4               ØUT     ADATA
DB2F 3E77               MVI     A,77H
DB31 D3C6               ØUT     BDATA
DB33 3E14               MVI     A,14H
DB35 D3C5               ØUT     AC0NT
DB37 3E04               MVI     A,4
DB39 D3C7               ØUT     BC0NT
DB3B C9                 RET
                ;
                ; CHECK FØR CØNSØLE INPUT READY
                ;
DB3C DB10       CØNST:  IN      CSTAT   ;GET STATUS
DB3E E601               ANI     CIMSK
DB40 C8                 RZ              ;NØT READY
DB41 3EFF               MVI     A,TRUE
DB43 C9                 RET             ;INPUT READY
                ;
                ; CØNSØLE INPUT
```

MANAGE

NATURAL LANGUAGE DATA BASE MANAGER FOR THE ALPHA MICRO SYSTEM

Allows processing of files by sentences written in English, rather than by programs written in a computer language. For example, you may ask the computer to "List prospects whose interest is houses and whose price is between $60,000 and $90,000 by Zip Code as labels".

Definitional capability allows easy categorization of records into terms meaningful to the user. For example, telling the computer "DEF: Pasadena Residents: Mailing whose Zip Code is between 91101 and 91108 but not 91102" would allow subsequent processing using only the words "Pasadena Residents" to refer to that group. User defined terms are unlimited in form, length and number.

Help messages are available throughout the system for user convenience. By simply entering a question mark, at any time, the system will respond with a message specifying the type of input MANAGE is expecting. Dual question marks will print the message in greater detail. Triple question marks will display a complete, menu driven user's manual.

Other special features include: user defined, unlimited length fields; access from user programs via command files; passwords; background processing; and flexible output formatting.

A new approach to memory management optimizes the mapping of data, and the loading of programs, for maximum operating speed in the amount of memory available in the user's system. This is done automatically, and is transparent to the user. Thus thousands of records can be stored, ordered, categorized and otherwise processed in a matter of seconds, rather than in minutes or hours. Practical applications include:

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Market analysis	Quality Control Records
Inventory files	Telephone directory
Personnel files	Reservation system
Customer listing	Mail order management
Buyer's Guide	Library cross indexing
Budget Analysis	Appointment scheduling
Price lists	Employment agency files

A ready-to-use disk, with complete user's manual, is priced at $1250. A demonstration disk, with a maximum capacity of 90 records, is available for $100. Manual only, $5.00. Enhanced versions, as they become available, will be available to all users for a copying charge of $25.00, including revised manual.

CompuWest offers complete, turn-key systems with Video terminal, High speed printer, 48K memory, and a 10 Megabyte hard disk drive at prices starting at $15,750.

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```
                ;
                CØNIN:
DB44 DB10       CIN2:   IN      CSTAT   ;CHECK STATUS
DB46 E601               ANI     CIMSK
DB48 CA44DB             JZ      CIN2
DB4B DB11               IN      CDATA   ;GET DATA
DB4D E67F               ANI     7FH     ;MASK PARITY
DB4F C9                 RET
                ;
                ; CØNSØLE ØUTPUT
                ;
DB50 3A0300     CØNØUT: LDA     IØBYTE  ;WHERE?
DB53 E603               ANI     3
DB55 B7                 ØRA     A
DB56 E264DB             JPØ     LØUT    ;LIST
                ;
DB59 DB10       CØNW:   IN      CSTAT   ;CHECK STATUS
DB5B E602               ANI     CØMSK
DB5D CA59DB             JZ      CØNW
DB60 79                 MØV     A,C     ;GET BYTE
DB61 D311               ØUT     CDATA   ;SEND IT
DB63 C9                 RET
                ;
                ; LIST ØUTPUT
                ;
                LØUT:
DB64 DB12       LIST:   IN      LSTAT   ;CHECK STATUS
DB66 E602               ANI     LØMSK
DB68 CA64DB             JZ      LIST
DB6B 79                 MØV     A,C     ;GET BYTE
DB6C D313               ØUT     LDATA   ;SEND IT
DB6E FE0C               CPI     FFEED   ;FØRMFEED?
DB70 C0                 RNZ             ;NØ
                ;
                ; EMULATE FØRMFEED WITH 9 LINES
                ;
DB71 C5                 PUSH    B
DB72 010A09             LXI     B,900H+LF
DB75 CD64DB     LSKIP:  CALL    LIST
DB78 05                 DCR     B
DB79 C275DB             JNZ     LSKIP
DB7C C1                 PØP     B
DB7D C9                 RET
                ;
                ; PUNCH ØUTPUT SENT TØ MØDEM
                ;
DB7E 79         PUNCH:  MØV     A,C     ;GET BYTE
DB7F E67F               ANI     7FH
DB81 B7                 ØRA     A       ;NULL?
DB82 C8                 RZ              ;DØN'T SEND
DB83 FE0A               CPI     LF
DB85 C8                 RZ              ;SKIP LINEFEED
DB86 CD9FDB             CALL    MØUT    ;SEND
DB89 FE0D               CPI     CR
DB8B CA94DB             JZ      MØDCR   ;WAIT FØR CR
DB8E CDAADB             CALL    MIN     ;MØDEM INPUT
DB91 D311               ØUT     CDATA   ;SEND TØ CØNSØLE
DB93 C9                 RET
                ;
                ; SEND <CR> TØ MØDEM, WAIT FØR ØNE BACK
                ;
DB94 CDAADB     MØDCR:  CALL    MIN
DB97 D311               ØUT     CDATA   ;TØ CØNSØLE
DB99 FE0D               CPI     CR
DB9B C294DB             JNZ     MØDCR   ;KEEP TRYING
DB9E C9                 RET
                ;
                ; MØDEM ØUTPUT
                ;
DB9F DB14       MØUT:   IN      MSTAT   ;CHECK STATUS
DBA1 E630               ANI     MØMSK
DBA3 CA9FDB             JZ      MØUT
DBA6 79                 MØV     A,C     ;GET BYTE
DBA7 D315               ØUT     MDATA   ;SEND IT
DBA9 C9                 RET
                ;
                ; MØDEM INPUT
                ;
DBAA DB14       MIN:    IN      MSTAT   ;CHECK STATUS
DBAC E640               ANI     MIMSK
DBAE CAAADB             JZ      MIN
DBB1 DB15               IN      MDATA   ;GET BYTE
DBB3 E67F               ANI     7FH     ;MASK PARITY
DBB5 C9                 RET
                ;
DBB6 31302D322D         DB      '10-2-79' ;VERSIØN
                ;
DBBD                    END
00C5 AC0NT      00C4 ADATA      00C7 BC0NT      00C6 BDATA
D600 BI0S       0011 CDATA      0001 CIMSK      DB44 CIN2
0002 C0MSK      DB44 C0NIN      DB50 C0N0UT     DB3C C0NST
DB59 C0NW       000D CR         0010 CSTAT      0000 FALSE
000C FFEED      DB15 INIT       0003 I0BYTE     0013 LDATA
000A LF         0001 LIMSK      DB64 LIST       0002 L0MSK
DB64 L0UT       DB75 LSKIP      0012 LSTAT      0015 MDATA
0040 MIMSK      DBAA MIN        DB94 M0DCR      0080 M0MSK
DB9F M0UT       0036 MSIZE      0014 MSTAT      4900 0FFSET
DB7E PUNCH      DB00 START      FFFF TRUE       DB00 USER
```

NEW PRODUCTS!

Super Color S-100 Video Kit $99.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc.

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32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. Not expandable to high resolution Graphics.

Elf II Adapter Kit $24.50

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Quest, the leader in inexpensive 1802 systems announces another first. Quest is the first company worldwide to ship a **full size Basic** for 1802 systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range $\pm .17E^{38}$), 32 bit integer ± 2 billion; Multi dim arrays; String arrays; String manipulation; Cassette I/O, Save and load, Basic, Data and machine language programs; and over 75 Statements, Functions and Operators.

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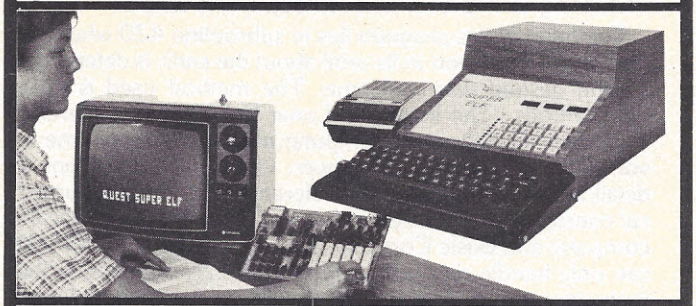

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Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

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The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

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Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and research and development.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** Expansion Cabinet with room for 4 S-100 boards **$41.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a 12 page monthly software publication for 1802 computer users is available by subscription for $12.00 per year.

Tiny Basic Cassette **$10.00,** on ROM **$38.00,** original Elf kit board **$14.95. 1802 software;** Moews Video Graphics **$3.50.** Games and Music **$3.00,** Chip 8 Interpreter **$5.50.**

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

A IK Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatible cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. The Super Monitor is written with subroutines allowing users to take advantage of monitor functions simply by calling them up. Improvements and revisions are easily done with the monitor. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50. A 50 pin connector set** with ribbon cable is available at $15.50 for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply).

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7495N	.69
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74107N	.35
74121N	.34
74123N	.59
74125N	.45
74145N	.69
74150N	.95
74151N	.69
74154N	1.00
74157N	.69
74161N	.87
74162N	.87
74163N	.87
74174N	.96
74175N	.90
74190N	1.15
74192N	.87
74193N	.85
74221N	2.00
74298N	1.65
74365N	.66
74366N	.66
74367N	.66

74LS00 TTL

74LS00N	.35
74LS02N	.35
74LS04N	.35
74LS05N	.35
74LS08N	.35
74LS10N	.35
74LS13N	.55
74LS14N	1.10
74LS20N	.35
74LS22N	.35
74LS28N	.41
74LS30N	.35
74LS33N	.75
74LS38N	.55
74LS74N	1.25
74LS75N	1.00
74LS90N	.85
74LS93N	.70
74LS95N	1.10
74LS107N	.45
74LS112N	.45
74LS113N	.35
74LS132N	.89
74LS136N	.45
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LM340K-12	1.35
LM340K-15	1.35
LM340K-24	1.35
LM340T-5	1.25
LM340T-8	1.25
LM340T-12	1.25
LM340T-15	1.25
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LM340T-24	1.25
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LM377	3.00
CD4070	.50
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CD4072	.28
CD4073	.28
CD4075	.28
CD4076	1.45
CD4078	.40
CD4081	.28
CD4082	.28
CD4116	.47
CD4190	5.50
CD4507	1.00
CD4508	4.25
CD4510	1.02
CD4511	.94
CD4515	2.52
CD4516	1.10
CD4518	1.02
CD4520	1.02
CD4527	1.51
CD4528	.79
CD4553	3.50
CD4566	2.25
CD4583	4.50
CD4585	1.10
CD40192	3.00
74C00	.28
74C04	.40
74C10	.28
74C14	2.10
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74C30	.28
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74C76	1.40
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CD4008	.28
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CD4010	.45
CD4011	.28
CD4012	.28
CD4013	.39
CD4014	1.00
CD4015	1.00
CD4016	.45
CD4017	1.05
CD4018	.94
CD4019	.45
CD4020	1.02
CD4021	1.25
CD4022	1.10
CD4023	.28
CD4024	.75
CD4025	.28
CD4026	2.00
CD4027	.66
CD4028	.85
CD4029	1.02
CD4030	.45
CD4035	1.02
CD4040	1.02
CD4042	.85
CD4043	.85
CD4044	.85
CD4046	1.67
CD4049	.45
CD4050	.49
CD4051	1.13
CD4060	1.42
CD4066	.71
CD4068	.40
CD4069	.40
CD4070	.50

INTERFACE

8095	.65
8096	.65
8097	.65
8098	.65
8T09	1.25
8T10	4.50
8T13	3.00
8T20	5.50
8T23	3.10
8T24	3.50
8T25	3.20
8T26	1.69
8T28	2.75
8T97	1.69
8T98	1.69

MOS/MEMORY

RAM

2101-1	3.95
2102-1	.95
2102AL-4	1.25
2102AN-2L	1.60
21L02-1	1.18
21P02	1.25
2104A-4	4.95
2107B-4	3.75
2111-1	3.75
2112-2	3.95
2114L-1	7.40
2114L-3	7.90
4116	10.95
2513B	6.30
MM5262	.40
MM5280	3.00
MM5320	9.95
MM5330	5.94
PD411D-3	4.00
PD411D-4	5.00
P510TL	13.95
4200A	9.95
82S25	2.90
91L02A	1.50
HD0165-5	6.95
MM5710N	4.50
GIAY38500-1	9.95
MCM6571A	9.95
9368	3.50
4102	10.00
416	16.00

CLOCKS

MM5314	3.90
MM5369	2.10
MM5841	14.45
MM5865	7.95
CT7001	5.80
CT7010	8.95
MM5375AA/N	3.90
MM5375AG/N	4.90
7205	16.50
7207	7.50
7208	15.95
7209	4.95
DS0026CN	3.75
DS0056CN	3.75
MM53104	2.50

MICROPROCESSOR

6800	17.50
6802	18.75
8080A	8.95
8085	27.00
Z80	14.75
Z80A	19.75
8212	2.90
8214	8.00
8216	2.90
8224	2.90
8228	5.35
8251	8.50
8253	15.00
8255	9.25
8257	19.50
8259	19.50
1802CP	
plas.	13.95
1802DP	
plas.	17.95
1861P	11.50
CDP1802CD	19.95
CDP1802D	25.00
CDP1861	12.95
6820	9.95
6850	12.95
6502	12.50
6504	16.50
6522	13.60

UART/FIFO

AY5-1013	5.50
AY5-1014	7.50
3341	6.95

PROM

1702A	3.95
2708	10.50
2716T1	29.50
2716 Intel	48.00
2732	115.00
2758	22.50
8741A	85.00
8748	75.00
8748-8	60.00
8755A	65.00
N82S23	2.95
N82S123	3.50
N82S126	3.75
N82S129	3.75
N82S131	3.75
N82S136	6.75
N82S137	8.75
DM8577	2.90
8223	2.90

CONNECTORS

30 pin edge	2.50
44 pin edge	2.75
100 pin edge	4.50
100 pin edge WW	5.25

IC SOCKETS

Solder Tin PIN	1 UP	Low Profile PIN	1UP
8	.15	22	.30
14	.14	24	.35
16	.16	28	.42
18	.27	36	.58
20	.29	40	.57

2 level 14 pin ww .20

WIRE WRAP LEVEL 3

PIN		PIN	
14	.32	24	.86
16	.33	28	1.00
18	.57	40	1.23

CRYSTALS

1 MHz	4.50
2 MHz	4.50
4 MHz	4.25
5 MHz	4.25
10 MHz	4.25
18 MHz	3.90
20 MHz	3.90
32 MHz	3.90
32768 MHz	4.00
1.8432 MHz	4.50
3.5795 MHz	1.20
2.0100 MHz	1.95
2.097152 MHz	4.50
2.4576 MHz	4.50
3.2768 MHz	4.50
5.0688 MHz	4.50
5.185 MHz	4.50
5.7143 MHz	4.50
6.5536 MHz	4.50
14.31818 MHz	4.25
18.432 MHz	4.50
22.1184 MHz	4.50

KEYBOARD ENCODERS

AY5-2376	$12.50
AY5-3600	17.95
74C922	5.50
74C923	5.50
HD0165-5	6.95

D Connectors RS232

DB25P	2.95
DB25S	3.95
Cover	1.50
RS232 Complete Set	6.50
DE9S	1.95
DA15P	2.10
DA15S	3.10

Hickok 3½ Digit LED

multimeter	69.95
Stopwatch Kit	26.95
Auto Clock Kit	17.95

TRANSISTORS

2N1893	.40
2N222A	.27
2N2369	.30
2N2904A	.20
2N2907A	.25
2N3053	.40
2N3638	.25
2N3643	.25
2N3904	.18
2N3906	.18
2N3055	.69
2N4400	.25
2N4401	.75
2N4402	.20
TIP31	.60
TIP33A	1.00

RESISTORS ¼ watt 5%

10 per type .03 1000 per type .012
25 per type .025 350 piece pack
100 per type .015 5 per type 6.75
½ watt 5% per type .05

KEYBOARDS

56 key ASCII keyboard kit	$67.50
Fully assembled	77.50
53 key ASCII keyboard kit	60.00
Fully assembled 70.00 Enclosure	14.95

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Red T018	.15
Green, Yellow T018	.20
Jumbo Red	.20
Green, Orange, Yellow Jumbo	.25
Cliplite LED Mounting Clips 8/$1.25	
(specify red, amber, green, yellow, clear)	

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PC board	7.50
Switches Mom. Pushbutton	.27
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Operates 5–18 Volt DC to 5 MHz typ. .125" LED display	**10.50**
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Clock Calendar Kit	**$23.95**
2.5 MHz Frequency Counter Kit	**$37.50**
30 MHz Frequency Counter Kit	**$47.75**

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12 Volt 300 ma transformer	1.25
12.6V CT 600 ma	3.75
12V 250 ma wall plug	2.95
12V CT 250 ma wall plug	3.50
24V CT 400 ma	3.95
10V 1.2 amp wall plug	4.85
12V 6 amp	12.95
12V 500 ma wall plug	4.75
12V 1 amp wall plug	6.50
12V 3 amp wall plug	8.50

DISPLAY LEDS

MAN1	CA	.270	2.90
MAN3	CC	.125	.39
MAN72/74	CA/CA	.300	1.00
DL704	CC	.300	1.25
DL707/DL707R	CA	.300	1.00
DL727/728	CA/CC	.500	1.90
DL747/750	CA/CC	.600	1.95
DL750	CC	.600	1.95
FND359	CC	.357	.70
FND500/507	CC/CA	.500	1.35
FND503/510	CC/CA	.500	.90
FND800/807	CC/CA	.800	2.20
4 digit Bubble			.60
4 digit Bubble			.80
DG8 Fluorescent			1.75
DG10 Fluorescent			1.75
5 digit 14 pin display			1.00
NSN69 9 digit display			.60
7520 Clairex photocells			.39
TIL311 Hex			9.50
MAN3640	CC	.30	1.10
MAN4610	CA	.40	1.20
MAN4640	CC	.40	1.20
MAN4710	CA	.40	.95
MAN4740	CC	.40	1.20
MAN6640	CC	.56	2.95
MAN6710	CA	.60	1.35
MAN6740	CC	.60	1.35
MA1002A		**8.95**	
MA1012A		**8.95**	
102P3 transformer		**2.25**	

ROCKWELL AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display, ROM monitor, fully expandable. $375.00. 4K version $450.00. 4K Assembler $85.00, 8K Basic Interpreter $100.00.

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16K Static RAM Kit	265.00
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16K Dynamic RAM KIt	199.00
32K Dynamic RAM Kit	310.00
64K Dynamic RAM Kit	470.00
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Moon

By Fred LaPlante

This program was constructed for use by those who need to point a radio antenna (or radio-telescope) at the center of the moon. It owes its existence to the need for a source of radio energy in the sky which could be used for calibration of communications satellite receiving stations. The moon, it turns out, is a suitable emission source but, unreasonably, will not stay put in the sky. Each day it is at a different place at any given time, thus requiring the engineer trying to make use of its properties to know when it will be in a usable part of the sky, or for that matter, when it will be above the horizon at all.

Because this program was to be used with relatively small (4-15 meter) parabolic antennas having beam widths from 0.4 to 1.2 degrees for frequencies of 4-6 GHz, the degree of precision normally provided in predicting positions of astronomical bodies could be relaxed considerably. After some review of the references, a figure of 1 minute (0.02 degrees) was finally settled on as the optimum compromise between precision of output and computational complexity. The result is a program with a source code requirement of approximately 10K bytes of memory including a large number of explanatory remarks.

Those interested in greater precision should not despair. Insofar as practical, all equations used are the same as those used in generating ephemerides of the moon, lacking only the full precision available for each constant or, in many cases, simply deleting terms whose contribution was considered negligible. All references are cited so that those wishing to improve the precision of the output may do so readily.

In use, the program is completely conversational, allowing the user an opportunity to enter his location, desired observation date and time range of interest. Output includes position data at the requested interval both in terms of apparent declination and right ascension, and in elevation and azimuth angles. If the moon is below the horizon, positional data is suppressed and a warning message printed. To eliminate ambiguities, all dates and time are GMT.

This program, MOON, consists of the main program, which interacts with the operator to get necessary inputs and report results, and a set of four major subroutines which perform all actual computations. The program is thus modular, and readers should hopefully find it comparatively easy to lift a complete routine for use elsewhere, provided they know enough astronomy and mathematics to realize the limitations of the routine involved. To aid in this respect, all variables are either the same as those used in the applicable references cited or are at least easily recognizable.

Those deciding to modify the program for use in their own computer should resist the temptation to simplify equations unless they are very conversant with mathematics as performed in digital computers. Several equations are written as they are to maintain the limited precision available to a machine using a 32-bit floating-point word. This problem, while always present in mathematical programs, is especially troublesome in those involving trigonometric work as astronomy does. The bulk of the debugging time spent on this program was used attempting to improve the accuracy of the output.

The heart of this program lies in subroutine 420 where the position of the moon in its orbit about the earth is determined for the desired date and time. The method used is taken directly from "The Improved Lunar Ephemeris" (Reference 2). Due to limitations of computer memory and the time involved in waiting for an answer, certain simplifications in detail had to be made. In the reference, the various numerical constants are specified with from 2 to 15 digits. Since the computer and Basic Compiler used (BASIC-E under CP/M) can only handle six places, all constants are rounded to that many places and, if necessary, shown in scientific notation to eliminate leading zeros.

The moon's position at any time is given in terms of three coordinates (latitude, longitude and parallax), each specified by an equation called a trigonometric series. The general form of such as equation is as follows:

$$LON = k_1 \bullet SIN(a_1) + k \bullet SIN(a_2) + \cdots + k_n \bullet SIN(a_n)$$

where k_1, k_2, --- k_n are constant coefficients

a_1, a_2, --- a_n are linear combinations of the fundamental parameters of L, O, L_1, L_2, D, F

The number of terms (n) normally used for the three coordinates are Longitude — 800, Latitude — 492, and Parallax — 247. However, if one does not need the full accuracy of which the equations are capable, many of the terms having very small coefficients may be dropped. Since the goal of this program was a result with a precision of one minute, those terms with coefficients less than one minute were dropped, reducing the number of terms to 13, 11 and 2, respectively.

For the benefit of those desiring more precision, the identification numbers of the terms used are given in the program. The final equations to be solved for each coordinate are listed in Table 1. In the actual program, the various coefficients have been converted from seconds to degrees by dividing through by 3600.

The next step is to convert latitude and longitude to right ascension and declination. This is accomplished by converting coordinates to polar form, rotating about the x-axis by an amount equal to the true obliquity of the ecliptic, and then converting the resulting new polar coordinates to rectangular form. The true obliquity itself is formed from another trigonometric series given in the "Explanatory Supplement to the Ephemeris":

$E_t = E_m - \Delta E$

where subscripts t and m indicate the true and mean values, respectively,
and

$Em = 23.4523 - .0130125T - .00000164T^2 + .000000503T^3$ (in degrees)

where $T = J/36525$,

and

$$\begin{aligned}\Delta E = {} & (92100 + 9.1T)\,COS(O) && \text{Term \#1}\\ & - (904 - 0.4T)\,COS(2O) && \text{Term \#2}\\ & + (5522 - 2.9T)\,COS(2F-2D+2O) && \text{Term \#8}\\ & + (216 - 0.6T)\,COS(L_1+2F-2D+2O) && \text{Term \#10}\\ & - (93 - 0.3T)\,COS(-L_2+2F-2D+2O) && \text{Term \#11}\\ & - (66 + 0.0T)\,COS(2F-2D+O) && \text{Term \#12}\\ & + (884 - 0.5T)\,COS(2F+2O) && \text{Term \#24}\\ & + (183 + 0.0T)\,COS(2F+O) && \text{Term \#26}\\ & + (113 - 0.1T)\,COS(L_1+2F+2O) && \text{Term \#27}\end{aligned}$$

(in seconds of arc)

Table 1.

LON =	2369.91 SIN(2D)	Term #3	Code 0
	+ 191.95 SIN(L_1+2D)	Term #6	
	+ 22639.50 SIN(L_1)	Term #7	
	− 4586.47 SIN(L_1−2D)	Term #8	
	− 668.146 SIN(L_2)	Term #15	
	− 165.145 SIN(L_2-2D)	Term #16	
	− 125.154 SIN(D)	Term #21	
	+ 769 SIN(2L_1)	Term #25	
	− 211.656 SIN(2L_1-2D)	Term #26	
	− 109.673 SIN(L_1+L_2)	Term #32	
	− 205.962 SIN(L_1+L_2−2D)	Term #33	
	+ 147.687 SIN(L_1−L_2)	Term #39	
	− 411.608 SIN(2F)	Term #51	
S =	− 112.79 SIN(D)	Term #313	Code 1
	+ 2373.36 SIN(2D)	Term #314	
	+ 192.72 SIN(L_1+2D)	Term #324	
	+ 22609.07 SIN(L_1)	Term #326	
	− 4578.13 SIN(L_1−2D)	Term #328	
	+ 767.96 SIN(2L_1)	Term #339	
	− 152.53 SIN(2L_1−2D)	Term #341	
	− 126.98 SIN(L_2)	Term #366	
	− 165.06 SIN(L_2−2D)	Term #368	
	− 115.18 SIN(L_1+L_2)	Term #384	
	− 182.36 SIN(L_1+L_2−2D)	Term #386	
	− 138.76 SIN(L_2−L_1)	Term #398	
N =	526.069 SIN(F-2D)	Term #595	Code 3
LAT =	18518.51 SIN(S)+0.999926N	Term #605	Code 6
PAR =	3422.70	Term #611	Code 5
	+ 186.539 COS(L_1)	Term #615	

NOTE: Code 2 and 4 terms not used.

The fundamental Parameters L, O, etc., are given as third degree polynomials in Reference 2, but in this program, due to their small contributions, the square and cubic terms are dropped, yielding the following:

L	= 0.751213+J(.366011E-1)	mean longitude of moon
O	= 0.719954−J(.147094E-3)	mean longitude of moon's node
L_1	= 0.822513+J(.362916E-1)	L-perigree of sun
L_2	= 0.995766+J(.272778E-2)	mean lon of sun − perigree of sun
D	= 0.072710+J(.338632E-1)	L − mean longitude of sun
F	= 0.312525+J(.367482E-1)	L − mode of moon

and where $J = \left[\frac{MOD(I,12)+7+365\bullet I}{12}\right] + DAY + \left[\frac{I}{48}\right] - \left[\frac{I}{1200}\right] + \left[\frac{I}{4800}\right] - 693901 + GMT/24 - 0.5$

and I = (12-year)+month−3

[arg] = integer value of argument

GMT = GMT time in decimal hours (i.e., 13.5 = 1:30 PM)

The original equation for ΔE has been reduced to the above nine terms from the original 40 by again eliminating those terms whose individual contribution, considering only the constant part, was less than 1 minute.

Having now obtained the moon's declination and right ascension coordinates, we proceed to convert them to azimuth and elevation for the benefit of those whose equipment requires it. At this point we must introduce a correction for parallax to account for the observer not being located at the earth's center. This can be a significant correction as can be seen from the sample problems given at the end of the program listing. The correction is made by adjusting both declination and right ascension by ΔDec and ΔR.A., respectively. These are computed from

$$\Delta R.A. = ARCTAN\left[\frac{R\bullet COS(OLAT)\bullet SIN(PAR)\bullet SIN(H0)}{COS(DEC0)-R\bullet COS(OLAT)\bullet SIN(PAR)\bullet COS(H0)}\right]$$

$$\Delta Dec = ARCTAN\left[\frac{R\bullet SIN(OLAT)\bullet SIN(PAR)\bullet[COS(DEC0)-M\bullet SIN(DEC0)]}{1-R\bullet SIN(OLAT)\bullet SIN(PAR)\bullet[M\bullet COS(DEC0)+SIN(DEC0)]}\right]$$

where: $M2 = COT(OLAT)\bullet[COS(H0)-SIN(H0)\bullet TAN(\Delta R.A./2)]$

$R\bullet SIN(OLAT)\bullet SIN(PAR) = S1 - SIN(OLAT)\bullet SIN(PAR)$

$R\bullet COS(OLAT)\bullet SIN(PAR) = C\bullet COS(OLAT)\bullet SIN(PAR)$

$COT(OLAT) = 1/[.993277\bullet TAN(OLAT)]$

$S1 = 0.994953 - 0.167783E-2\bullet COS(2\bullet OLAT) + 0.212E-5\bullet COS(4\bullet OLAT)$

$C = 0.00169 - 0.168919E-2\bullet COS(2\bullet OLAT) + 0.214E-5\bullet COS(4\bullet OLAT)$

H0 = LST − R.A. both LST (Local Sidereal Time) and R.A. (Right Ascension) have been previously computed.

After making the adjustment, the new values are used to compute the elevation and azimuth angles using coordinate rotation methods similar to that described earlier for converting latitude and longitude to declination and right ascension.

This completes the calculations for a specific time on a specific day. For a different value of either, the entire process is repeated, so that for hourly positional data, the entire set is performed 24 times. Using the BASIC-E interpreter on my much-modified Altair 8800 (8080 CPU), it takes approximately five seconds to perform the calculations for each time/date set.

For ease of debugging and program verification, the program provides for printing the results of several intermediate computations if the operator specifies a location name of "TEST". If the sample problems contained at the end of the listing are run with such a location name, it will be possible to verify that the program provides answers essentially the same as the "official" publications in the field. While such an approach might seem like a waste of memory and typing time to many, be assured that it is well worth it when something occurs to cause one to wonder if the program still works after some "minor" change.

```
                LUNAR POSITION DATA FOR 24 APR 1948
                          FOR TEST
                        38 55 12.3 N
                        77  3 56.25 W

GMT          LST          DEC          RT.ASN          AZ          ELEV

1200         MOON BELOW HORIZON

JD = 17646                CENTURIES = .483121
L = 3.85944               O = .781207              L1 = 1.4086
L2 = 1.92666              D = 3.29363              F = 3.07871
LAT = 3.33402E-03                                  LON = 3.94899
E.MEAN = 23.446                                                    PAR = 1.67398E-02
S = .994598               DELTA E = 67755.2                        E.TRUE = .409177
DEC0 = -.294752           C = 1.00133              M = -4.36423E-02
R.A0 = 3.90492            DELTA.DEC = 9.84102E-03
                          DELTA.R.A = 1.36169E-02


ANOTHER DAY (YES/NO)? NO
ANOTHER OBSERVER LOCATION (YES/NO)? NO

     EPHEMERIS DATA              PROGRAM              ERROR

LAT      -12° 12.57612"          -11° 27.69"          44.89"
LON 226° 14' 22.39502"       226° 15' 37.66"       1' 15.26"
PAR      58' 5.94449"            57' 32.83"           33.11"
```

Figure 1. Sample Problem from Reference #2.

As an aid in determining the utility of MOON for your application, the test problem from "The Improved Lunar Ephemeris" was run and the results are shown in Figure 1. While the error in longitude slightly exceeds the desired goal of one minute, it was considered sufficiently close for the purpose. No attempt has been made to determine the degree of precision to be gained by increasing the number of terms in the various equations. Instead, it has been left as an exercise for the readers.□

Program follows

PROGRAM LISTING

```
REM - - REFERENCES
REM      1. "EXPLANATORY SUPPLEMENT TO THE EPHEMERIS", H. M. NAUTICAL ALMANAC
REM         OFFICE, LONDON, 1961.
REM      2. "IMPROVED LUNAR EPHEMERIS", 1952-1959", NAUTICAL ALMANAC OFFICE
REM         U. S.  NAVAL OBSERVATORY, WASHINGTON, 1954.
REM      3. SHUDDE, R. H. , HP-65 PROGRAMS #1614 & 1195, HP-65 USER'S
REM         LIBRARY, CARMEL, CA, 1974.

REM - - INTERNAL FUNCTIONS

REM    DEG, MIN, SEC TO DECIMAL DEG
         DEF FN. DECDEG(D, M, S)=D+((M+(S/60))/60)
REM    INTEGER RATIO A TO B
         DEF FN. RATIO(A, B)=INT(A/B)
REM    RADIANS TO DEGREES CONVERSION
         DEF FN. DEG(X)=X*(180/PI)
REM    DEGREES TO RADIANS CONVERSION
         DEF FN. RAD(X)=X*(PI/180)
REM    FRACTIONAL PART OF ARGUMENT
         DEF FN. FRAC(X)=X-INT(X)
REM    FRACTION OF REVOLUTION
         DEF FN. NORM(X)=PI2*FN. FRAC(X/PI2)
REM    ARCSIN FUNCTION
         DEF FN. ASIN(X)=ATN(X/SQR(1-X*X))
REM    ARCCOS FUNCTION
         DEF FN. ACOS(X)=(PI/2)-FN. ASIN(X)
REM    REMAINDER AFTER REPEATED A-B
         DEF FN. MOD(A, B)=A-(B*INT(A/B))
REM    24-HR TIME TO DECIMAL HRS
         DEF FN. DECHRS(X)=INT(X/100)+(FN. FRAC(X/100))/0. 6
REM    CONVERT DECIMAL TIME TO 4-DIGIT 24-HOUR TIME
         DEF FN. 2400$(X)=RIGHT$(("0000"+STR$(INT(100*(INT(X)+0. 6*
                          FN. FRAC(X))))), 5)
REM - - INITIALIZATION

         DIM MONTH$(12)
         DATA JAN, FEB, MAR, APR, MAY, JUN,     \
                 JUL, AUG, SEP, OCT, NOV, DEC
         FOR MONTH=1 TO 12
            READ MONTH$(MONTH)
         NEXT MONTH

         PI=3. 14159
         PI2=2*PI

REM - - GET USER INPUTS FROM KEYBOARD

50       PRINT "ENTER OBSERVER LOCATION NAME, LAT, LON"
         INPUT NAME$, LAD, LAM, LAS, LOD, LOM, LOS

         REM  CONVERT INPUT TO DECIMAL DEGREES FROM DEG, MIN, SEC
         OLAT=FN. DECDEG(LAD, LAM, LAS)
         OLON=FN. DECDEG(LOD, LOM, LOS)

10       PRINT "DATE OF INTEREST - GMT (IE 7, JUN, 1977)"
         INPUT DAY, MON$, YEAR

         IF (DAY<1) OR (DAY>31) THEN    \
            PRINT "INVALID DAY NUMBER"    :\
            GOTO 10

         IF (YEAR<1900) OR (YEAR>2000) THEN    \
            PRINT "ONLY YEARS 1900-2000 ARE ACCEPTABLE"    :\
            GOTO 10

         FOR MONTH=1 TO 12
            IF MONTH$(MONTH)=LEFT$(MON$, 3) THEN 20
         NEXT MONTH
         PRINT "INVALID MONTH NAME"
         GOTO 10

20       PRINT "TIME RANGE (START, END) GMT"
         INPUT START. , FINISH.
         IF START. <>FINISH.  THEN    \
            PRINT "INTERVAL IN FRACTIONAL HOURS"
            INPUT INTERVAL

         REM  CONVERT TIMES TO DECIMAL HRS.
         START=FN. DECHRS(START. )
         FINISH=FN. DECHRS(FINISH. )
REM - - PRINT OUTPUT HEADING

         PRINT CHR$(12); TAB(20); " "
         PRINT : PRINT : PRINT : PRINT : PRINT
         PRINT TAB(20); "LUNAR POSITION DATA FOR "; DAY; MON$; " "; YEAR
         PRINT TAB(30); "FOR "; NAME$
         PRINT TAB(35); LAD; LAM; LAS; "N"
         PRINT TAB(34); LOD; LOM; LOS; "W"
         PRINT : PRINT : PRINT
         PRINT "GMT"; TAB(9); " LST"; TAB(22); "DEC"; TAB(34); "RT. ASN";
               TAB(46); "  AZ  "; TAB(58); " ELEV "
         PRINT

REM - - BEGIN PROCESSING LOOP

         FOR GMT=START TO FINISH STEP INTERVAL

                  REM  COMPUTE JULIAN DATE AND SIDEREAL TIME
                  GOSUB 410

                  REM  COMPUTE MOON'S GEO-CENTRIC LATITUDE & LONGITUDE
                  GOSUB 420

                  REM  CONVERT TO DECLINATION AND RT ASCENSION
                  GOSUB 430

                  REM  CONVERT TO AZIMUTH AND ELEVATION ANGLES
                  GOSUB 440

                  REM  CONVERT TO DEG FROM RAD FOR OUTPUT
                  ELEV=FN. DEG(ELEV)
                  AZ=FN. DEG(AZ)
                  DEC=FN. DEG(DEC)
                  RT. ASN=FN. DEG(RT. ASN)

                  REM  CONVERT GMT TO 24-HR TIME
                  TIME$=FN. 2400$(GMT)

                  REM  PRINT RESULTS
                  IF (ELEV<=0) THEN    \
                     PRINT TIME$; TAB(10); "MOON BELOW HORIZON"    :\
                  ELSE    \
                     PRINT TIME$; TAB(10); LST; TAB(22); DEC; TAB(34);    \
                           RT. ASN; TAB(46); AZ; TAB(58); ELEV

                  REM  PROGRAM TEST & EVALUATION OUTPUT
                  IF (NAME$="TEST") THEN    \
                     PRINT    :\
                     PRINT "JD="; JD1900, "CENTURIES="; T    :\
                     PRINT "L="; L, "O="; O, "L1="; L1    :\
                     PRINT "L2="; L2, "D="; D, "F="; F    :\
                     PRINT "LAT="; LAT, "LON="; LON, "PAR="; PAR    :\
```

Radio Hut

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ORDER BY PHONE—214-324-5509

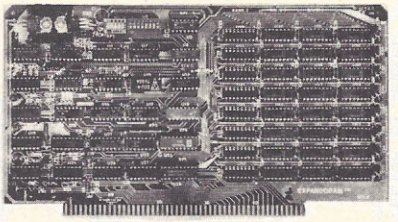
PLEASE WRITE FOR CATALOG OR WHILE IN DALLAS, VISIT OUR RETAIL STORE AT 201 LOCHWOOD MALL, DALLAS, TEXAS 75218 (GARLAND ROAD AT JUPITER).

ORDERING INFORMATION & TERMS: Orders under $15.00 add 75¢ handling. No C.O.D. We accept Visa, MasterCharge, and American Express cards. Tex. Res. add 5% tax. Foreign orders (except Canada) add 20% P&H. 90 Day Money Back Guarantee on all items. Add 5% P&H, maximum $5.00.
ORDER BY PHONE — (214) 324-5509

SD EXPANDORAM

The EXPANDORAM is available in versions from 16K up to 64K, so for a minimum investment you can have a memory system that will grow with your needs. This is a dynamic memory with the invisible on-board refresh, and IT WORKS!

- Bank Selectable
- Phantom
- Power 8VDC, +16VDC, 5 Watts
- Lowest Cost Per Bit
- Uses Major Brand 16K RAMS
- PC Board is doubled solder masked and has silk-screened parts layout
- Extensive documentation clearly written



- Complete kit includes all Sockets for 64K
- Memory access time: 375ns, Cycle time: 500ns.
- No wait states required
- 16K boundaries and Protection, via Dip Switches
- Designed to work with Z-80, 8080, 8085 CPU's

EXPANDORAM 64K Kit (16K Ram)

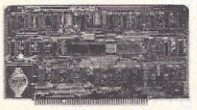
WITHOUT MEMORY	**$139.00**
16K	**209.00**
32K	**275.00**
48K	**340.00**
64K	**405.00**

SD'S PROM 100 PROM Programmer Board

The PROM-100 Programmer is a development tool for S-100 Bus computer systems. The Zero Insertion Force Programming Socket extends above the card cage height for easy access to PROM devices. Software verifies PROM erasure, verifies program loading and provides for reading of object file from Disk or PROM and programming into PROM/EPROM. Features include: On-board generated 25vdc Programming pulse, TTL compatible, maximum programming time for 16,389 bits is 100 seconds. Programs: 2708, Intel 2758, 2716, 2732 and TI 2516. DIP Selectable EPROM type.

PROM-100 Board Kit $149.95

SD'S MPB-100 Z80 CPU BOARD KIT



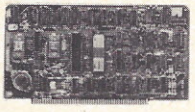
The MPB-100 provides a Z80 microprocessor based CPU for S-100 Bus systems. Front panel usage is optional, making the MPB-100 suitable for upgrading existing systems to Z80 level. A PROM socket is provided on-board which makes the MPB-100 adaptable to process control applications. Features include: Power-on Jump to 4K boundaries, 2 Megahertz or 4 Megahertz operation, optional wait states, on-board PROM socket.

MPB-100 KIT $199.00

SD'S VERSAFLOPPY II

• IBM 3740 Compatible Soft Sectored Format for Single Density Drives • Operates with Single and Dual Sided Drives, Single or Double Density Drives and 5" & 8" Drives — in any combination of four simultaneously • Drive Select and Side Select Circuitry • S-100 Bus Compatible • Vectored Interrupt Operation Optional • Phase Locked Loop Data Recovery Circuit • Operates with Z80 CPU's • Uses FD1791-1 Controller Chip • Ther Versafloppy II incorporates all the possible features of a flexible disk drive controller into one board. Capable of handling four drives simultaneously, combinations of any variety are possible, such as 5" single sided, 8" dual density dual sided, 5" dual density single sided. Most popular drives are controlled directly with the Versafloppy II. The operating system for the Versafloppy II is the extremely powerful SDOS available for SD Systems. Diagnostic and control software available to complete your disk system.

$290 KIT, $385.00 ASSEMBLED & TESTED



SD'S VDB-8024 VIDEO DISPLAY BOARD

The VDB-8024 features its own on-board Z80 microprocessor. This gives the capability of using software (included in ROM) to control functions and enhancements without interference with the computer's CPU. Included in the special features: 80 characters by 24 lines display, keyboard power and interface, composite and separate video output, 2K on-board RAM, a total of 256 available characters, full cursor control, forward and reverse scrolling, underlining, field reverse, field protect enhancements, programmable characters. **VDB-8024 KIT $289.00**

SD'S "VERSAFLOPPY I" KIT

FEATURES: IBM 3740 soft sectored compatible, S-100 BNS Compatible for Z-80 or 8080. Controls up to 4 drives (single or double sided). Directly controls the following drives: Sugart SA400/450 Mini Floppy • Shugart SA800/850 Standard Floppy • PERSCI 70 and 277 • MFE 700/750 • CDC 9404/9406

$135.00

SD'S SBC-100 SINGLE BOARD COMPUTER

The SBC-100 provides a complete micro-computer on a single board! The Z80 microprocessor is used as the heart of the SBC-100. The SBC-100 meets all the requirements of a Z80 CPU board with the added features of I/O ports, counter/timer channels, on board RAM, provisions for PROM/ROM and a software programmable baud rate generator. S-100 Bus compatible, the SBC-100 features are: 8K bytes of available PROM, 1024 bytes on-board RAM, Serial I/O with both synchronous and asynchronous operation, Parallel I/O ports, Operational Vectored Interrupts, and Four Counter/Timer Channels. SD Monitor available for RS-232 and Video Terminals. Disk based system software also available.

SBC-100 KIT $209.00

TARBELL FLOPPY DISK INTERFACE

Compatible with Z80 & 8080. S-100 Bus. Uses CPM operating system. Plugs directly into your IMSAI or ALTAIR • Fastest transfer rate

KIT $190.00 Assembled & Tested $260.00

TARBELL CASSETTE INTERFACE

Plugs directly into your IMSAI or ALTAIR • Fastest transfer rate • Extremely reliable • Phase encoded • 4 extra status & control lines

KIT $99.95

COMPUTER CORNER

CPU'S

Z80	$10.99

RELATED CHIPS

2114 (300ns)	$5.99
Z80 PIO	$9.95
2708	**$7.99**
4115	8/$34.95
4116	8/$80.00

DISC CONTROLLER

1771	$29.95
1791	**$37.95**

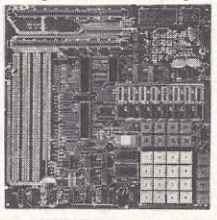
IC SOCKETS

SOLDER TIN PIN		LOW PROFILE PIN	
8	.12	16	.17
14	.15	18	.24
24	.32	40	.54
28	.39	20	.26

Z80 STARTER KIT

Kit: $219.95 Assembled & Tested $369.95

SD System's Z80 Starter Kit enables the novice to build a complete microcomputer on a single board. Featuring the powerful Z80 microprocessor, the Z80 Starter Kit features • Keyboard and Display • Audio Interface • PROM Programmer • Expansion and Wire Wrap Area • On Board RAM • 4 Channel Counter/Timer • Z-BUG Monitor in PROM • I/O Ports.



DIP SWITCHES

3 Pos.	**$1.10**
4 Pos.	**$1.12**
5 Pos.	**$1.16**
6 Pos.	**$1.20**
7 Pos.	**$1.22**
8 Pos.	**$1.26**
9 Pos.	**$1.36**
10 Pos.	**$1.30**

LEDS AND READOUT

Jumbo Red LED's	**8/1.00**
Jumbo Green LED's	**4/.95**
Jumbo Yellow LED's	**4/.95**
Jumbo Amber LED's	**4/.95**
MV Red	**10/1.00**
FND 70CC	**.50**
DL 707	**.95**
DL 747CA	.65
DL 728CC	**1.19**
FND 800CC	**1.50**
Red Filter 4" Bezel	**2.50**
Green Filter 4" Bezel	**2.50**
Amber Filter 4" Bezel	**2.50**
4N25	**1.60**
4N26	**1.25**
4N27	**1.10**
4N28	**.95**
4N31	**1.20**

S-100 CONNECTORS

High-Quality Gold Pins

$2.99 EACH

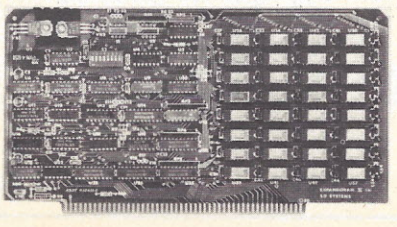
FLOPPY DISK SPECIAL

5.25" SOFT, 10 OR 16 SECTOR
10 FOR $29.95
8" SOFT SECTORED IBM COMPATIBLE
10 FOR $34.95

SD'S EXPANDORAM II

The Randem Access Memory

- S-100 Bus Compatible
- Up to 4Mhz Operation
- Expandable Memory from 16K to 256K
- DIP Switch Selectable Boundaries
- Uses 16K (4116) or 64K (4164) Memory Devices
- Page Mode Operation Allows up to 8 Memory Boards on Bus
- Operates with Z80 CPU's
- Phantom Output Disable
- Invisible Refresh (Synchronized with Wait States)



SD Systems' ExpandoRAM II is a dynamic RAM board with capacities from 16K bytes (4116) to 256K bytes (4164). It operates on the industry S-100 Bus. The design allows 8 boards to operate from the same S-100 Bus. The ExpandoRAM II is compatible with most S-100 CPU's based on the Z80 microprocessor.

EXPANDORAM II KIT

W/O	**$195.00**
16K	**285.00**
32K	**375.00**
48K	**465.00**
64K	**555.00**

CIRCLE INQUIRY NO. 93

```
        PRINT "E. MEAN=";E. M,"DELTA E=";DEL. E,"E. TRUE=";E. T    :\
        PRINT "S=";S1,"C=";C,"M=";M    :\
        PRINT "DECO=";DECO,"DELTA. DEC=";DEL. DEC    :\
        PRINT "R. AO=";RT. ASNO,"DELTA R. A=";DEL. RA    :\
        PRINT
      NEXT GMT

REM - - DETERMINE IF USER WISHES ANOTHER RUN

30    PRINT : PRINT : PRINT : PRINT : PRINT
      PRINT "ANOTHER DAY (YES/NO)";
      INPUT AN$
      IF AN$="YES" THEN 10
      IF AN$<> "NO" THEN 30

40    PRINT "ANOTHER OBSERVER LOCATION (YES/NO)";
      INPUT AN$
      IF AN$="YES" THEN 50
      IF AN$<>"NO" THEN 40

REM - - MOVE PAPER OUT OF PRINTER BEFORE STOPPING
      FOR I=1 TO 8
         PRINT
      NEXT I
      STOP
REM - - - - - - - SUBROUTINES - - - - - -


REM - - COMPUTE JULIAN DATE FROM CALENDER DATE (GMT)
REM     USING METHOD FROM SINGLETON - REF #3

410   I=(12*YEAR)+MONTH-3
      J1=INT((2*(FN. MOD(I,12)/12))+(7/12)+(365*(I/12)))
      J2=DAY+FN. RATIO(I,48)-FN. RATIO(I,1200)+FN. RATIO(I,4800)
      JD1900=J1+J2-693901+GMT/24-0. 5

REM - - COMPUTE LOCAL SIDEREAL TIME IN DEGREES (P. 75 OF REF #1)
      T=JD1900/36525
      REM  GMST=((23925. 84+T*(8640184. 54+0. 09*T))/3600)+GMT
      REM  BUT TO RETAIN PRECISION, DIVIDE THROUGH BY 3600 FIRST
      GMST=(6. 64607+(2400. 05+. 000025*T)*T)+GMT
      LSTH=24*FN. FRAC((GMST-(OLON/15))/24)
      LST=LSTH*15
RETURN
REM - - USING A SIMPLIFIED FORM OF "BROWN'S SOLUTION TO THE MAIN
REM     PROBLEM' OF THE MOON'S MOTION", THE LATITUDE, LONGITUDE,
REM     AND PARALLAX GEO-CENTRIC COORDINATES ARE COMPUTED.  REF #2,  PP283-363.
REM     ALL CONSTANTS GIVEN IN SECONDS HAVE BEEN DIVIDED BY 3600

REM     REQUIRED INPUTS ARE OBSERVATION DATE IN JULIAN FORM FOR EPOCH 1900

      REM  FUNDAMENTAL PARAMETERS OF MOON'S POSITION - REF #2,  P 288
      REM - MEAN LONGITUDE OF MOON
420      L =FN. FRAC(0. 7512130+FN. FRAC(JD1900*0. 366011E-1))*PI2
      REM - MEAN LONGITUDE OF MOONS NODE
         O =FN. FRAC(0. 7199540-FN. FRAC(JD1900*0. 147094E-3))*PI2
      REM - L-PERIGEE OF MOON
         L1=FN. FRAC(0. 8225130+FN. FRAC(JD1900*0. 362916E-1))*PI2
      REM - MEAN LONGITUDE OF SUN - PERIGEE OF SUN
         L2=FN. FRAC(0. 9957660+FN. FRAC(JD1900*0. 273778E-2))*PI2
      REM - L-MEAN LONGITUDE OF SUN
         D =FN. FRAC(0. 9742710+FN. FRAC(JD1900*0. 338632E-1))*PI2
      REM - L-NODE OF MOON
         F =FN. FRAC(. 312525E-1+FN. FRAC(JD1900*0. 367482E-1))*PI2

REM - - COMPUTE GEO-CENTRIC LONGITUDE - REF #2,PP351-353
      REM - CODE 0 TERMS 3,6,7,8,15,16,21,25,26,32,33,39,51
      SUM. LON= 6. 58309E-1*SIN(2*D)+5. 33203E-2*SIN(L1+2*D)    \
              +6. 28875E+0*SIN(L1)-1. 27402E+0*SIN(L1-2*D)    \
      COS. 2. LAT=COS(2*RLAT)
      COS. 4. LAT=COS(4*RLAT)

      S1=. 994953-. 167783E-2*COS. 2. LAT+. 212E-5*COS. 4. LAT
      C=1. 00169-. 168919E-2*COS. 2. LAT+. 214E-5*COS. 4. LAT
      R. SIN. LAT. SIN. PI=S1*SIN(RLAT)*SIN(PAR)
      R. COS. LAT. SIN. PI= C*COS(RLAT)*SIN(PAR)
      COT. LAT=1/(. 993277*TAN(RLAT))

      DEL. RA=ATN((R. COS. LAT. SIN. PI*SIN(HO))/    \
            (COS(DECO)-R. COS. LAT. SIN. PI*COS(HO)))
      M=COT. LAT*(COS(HO)-SIN(HO)*TAN(DEL. RA/2))
      DEL. DEC=ATN((R. SIN. LAT. SIN. PI*(COS(DECO)-M*SIN(DECO)))/
              (1-R. SIN. LAT. SIN. PI*(M*COS(DECO)+SIN(DECO))))

      REM  ADJUSTED VALUES
      RT. ASN=RT. ASNO-DEL. RA
      H=HO-DEL. RA
      DEC=DECO-DEL. DEC

      REM - - ELEVATION ANGLE
      Y=COS(H)*COS(DEC)
      X=SIN(DEC)
      GOSUB 100 : REM  CONVERT X,Y TO RHO @ PHI
      PHI=PHI+FN. RAD(OLAT) : REM  ROTATE VECTOR BY AMOUNT OF LATITUDE
      GOSUB 200 : REM  CONVERT RHO @ PHI TO X,Y
      ELEV=FN. ASIN(Y)

      REM - - AZIMUTH
      Y=-(SIN(H)*COS(DEC))
      GOSUB 100 : REM CONVERT X,Y TO RHO @ PHI
      AZ=FN. NORM(PHI+PI2)

RETURN

REM - - CONVERT RECTANGULAR COORDINATES TO POLAR FORM

100   RHO=SQR(X*X+Y*Y)
      PHI=ATN(Y/X)
      IF(SGN(X)<0) AND (SGN(Y)<0) THEN PHI=-(PI-PHI)
      IF(SGN(X)<0) AND (SGN(Y)>=0) THEN PHI=PI+PHI

RETURN


REM - - CONVERT POLAR COORDINATES TO RECTANGULAR FORM

200   IF PHI<0 THEN PHI=PHI+PI2
      IF PHI>PI2 THEN PHI=FN. NORM(PHI)
      X=RHO*COS(PHI)
      Y=RHO*SIN(PHI)

RETURN
REM - - SAMPLE PROBLEM PER PAGE 109 OF REF #1 - EXAMPLE 4. 11
REM     DETERMINE APPARENT LONGITUDE,LATITUDE AND PARALLAX OF THE MOON
REM     FOR 1960 MARCH 7 AT 0000 GMT
REM     NOTE THAT NO OBSERVER LOCATION IS REQUIRED.  FOR TEST PURPOSES
REM     OPERATOR MAY USE ANY COORDINATES OF INTEREST.

REM             APPARENT LONGITUDE 93D 9M 52. 762S =1. 626030 RADIANS
REM             APPARENT LATITUDE  -5D 13M 19. 726S=-9. 11436E-2 RADIANS
REM             HOR PARALLEX        54M 17. 574S=1. 57931E-2 RADIANS

REM             RT ASCENSION   6H 13M 16. 110S = 93. 317125D
REM             DECLINATION   18D 11M 00. 34S  = 18. 183428D

REM - - SAMPLE PROBLEM PER PAGES 58-61 OF REF #1
REM     COMPUTE ADJUSTMENTS TO RIGHT ASCENSION AND DECLINATION TO
REM     CORRECT FOR PARALLAX.
```

```
                -1.85596E-1*SIN(L2)-4.58736E-2*SIN(L2-2*D)    \
                -3.47650E-2*SIN(D)+2.13616E-1*SIN(2*L1)    \
                -5.87933E-2*SIN(2*L1-2*D)-3.04647E-2*SIN(L1+L2)    \
                -5.72117E-2*SIN(L1+L2-2*D)+4.10242E-2*SIN(L1-L2)    \
                -1.14336E-1*SIN(2*F)
        LON=L+FN.RAD(SUM.LON)
REM - - COMPUTE GEO-CENTRIC LATITUDE - REF #2, PP351-353
        REM - CODE 1 TERMS 313,314,324,326,328,339,341,366,384,386,398
        SUM.LAT.S= 3.13306E-2*SIN(D)+6.59267E-1*SIN(2*D)    \
                +5.35333E-2*SIN(L1+D)+6.28030E+0*SIN(L1)    \
                -1.27170E+0*SIN(L1-2*D)+2.13322E-1*SIN(2*L1)    \
                -4.23694E-2*SIN(2*L1-2*D)-3.52722E-2*SIN(L2)    \
                -4.58500E-2*SIN(L2-2*D)-3.19944E-2*SIN(L1+L2)    \
                -5.06556E-2*SIN(L1+L2-2*D)-3.85444E-2*SIN(L2-L1)
        REM - CODE 2 TERMS NOT USED
        REM - CODE 3 TERMS 595
        SUM.LAT.N=-1.46130E-1*SIN(F-2*D)
        REM CODE 4 TERMS NOT USED
        S=F+FN.RAD(SUM.LAT.S)
        LAT=FN.RAD(5.14403*SIN(S)+0.999926*SUM.LAT.N)
        REM - COMPUTE GEO-CENTRIC HORIZONTAL PARALLAX
        REM CODE 5 TERMS 611,615
        SUM.PAR=9.50750E-1+5.18166E-2*COS(L1)
        PAR=FN.RAD(SUM.PAR)
RETURN
REM - - CONVERT GEO-CENTRIC LATITUDE & LONGITUDE TO DECLINATION
REM     & RT. ASCENSION. THE EQUATIONS OF REF #1 (P.26) ARE SOLVED BY VECTOR
REM     METHODS AS DEMONSTRATED IN REF #3.

        REM - - FIRST COMPUTE TRUE OBLIQUITY

        REM - MEAN OBLIQUITY OF THE ECLIPTIC (REF #1,P.98)
430     E.M=23.4523+T*(-.130125E-1+T*(-.164E-5+T*.503E-6))

        REM - NUTATION IN OBLIQUITY (REF #1,P.44) IN .0001 SECONDS
        DEL.E=(92100+9.1*T)*COS(O)+(5522-2.9*T)*COS(2*F-2*D+2*O)    \
             +(-904+0.4*T)*COS(2*O)+(884-0.5*T)*COS(2*F+2*O)    \
             +(216-0.6*T)*COS(L1+2*F-2*D+2*O)    \
             +(183)*COS(2*F+O)+(113-0.1*T)*COS(L+2*F+2*O)    \
             -(93-0.3*T)*COS(-L2+2*F-2*D+2*O)    \
             -(66+0.5*T)*COS(2*F-2*D+O)

        REM - TRUE OBLIQUITY
        E.T=FN.RAD(E.M-DEL.E/3.6E7)

        REM - - DECLINATION
        X=COS(LAT)*SIN(LON)
        Y=SIN(LAT)
        GOSUB 100 : REM  CONVERT X,Y TO RHO @ PHI


        PHI=PHI+E.T : REM  ROTATE VECTOR BY AMOUNT OF OBLIQUITY
        GOSUB 200 : REM  CONVERT RHO @ PHI TO X,Y
        DECO =FN.ASIN(Y)

        REM - - RT ASCENSION
        Y=X
        X=COS(LAT)*COS(LON)
        GOSUB 100 : REM  CONVERT X,Y TO RHO @ PHI
        RT.ASNO=FN.NORM(PHI+PI2)

RETURN
REM - - COMPUTE AZIMUTH AND ELEVATION ANGLE TO CELESTIAL BODY.
REM     INPUTS ARE LOCAL SIDEREAL TIME, OBSERVER POSITION, AND BODY'S
REM     DECLINATION AND RT ASCENSION (IN RADIANS).

        REM - - FIRST ADJUST DEC & RA FOR PARALLAX REF#1, PP57-62.
440     HO=FN.RAD(LST)-RT.ASNO
        RLAT=FN.RAD(OLAT)
```

```
REM     1960 MARCH 13 AT 0317.8 GMT
REM     WASHINGTON,DC  38D 55M 12.30S N
REM                    77D  3M 56.25S W

REM             DECLINATION   3D 35M 24.40S
REM             RT ASCENSION 11H 22M 16.16S
REM             PARALLAX         57M 21.71S

REM             S=0.9945977  C=1.0013293  M=1.10499
REM             DELTA R.A.  = 0H  1M 23.44S = 4.04529E-4 RADIANS
REM             DELTA DEC   = 0D 33M 42.00S = 9.80293E-3 RADIANS

REM - - SAMPLE PROBLEM PER PAGES 351-352 OF REF #2
REM     VERIFY ACCURACY OF PREDICTION IN DETAIL.

REM     1948 APRIL 24 AT 1200 GMT

REM             L =3.859476 RAD    O = 0.781465 RAD    L1=1.413172 RAD
REM             L2=1.926443 RAD    D = 3.293491 RAD    F =3.078010 RAD
REM             LONGITUDE=226D 14M 22.39502S = 3.948625 RADIANS
REM             LATITUDE =    -12M 12.57612S = -3.551629E-3 RADIANS
REM             PARALLAX =     58M 5.94449S = 1.71597E-2 RADIANS

END
```

```
RUN MOON
BASIC-E INTERPRETER - VER 2.2

ENTER OBSERVER LOCATION NAME,LAT,LON
? WASH D.C.,38,55,12.3,77,3,56.25
DATE OF INTEREST - GMT (IE 7,JUN,1977)
? 24,APR,1948
TIME RANGE (START,END) GMT
? 0000,2400
INTERVAL IN FRACTIONAL HOURS
? 1

                LUNAR POSITION DATA FOR 24 APR 1948
                        FOR WASH D.C.
                              38 55 12.3 N
                              77 3 56.25 W

GMT     LST         DEC          RT.ASN       AZ          ELEV

0000    MOON BELOW HORIZON
0100    9.9931 6    -15.2336     218.381      116.284     7.44376
0200    10.9961     -15.3676     218.856      126.805     16.7711
0300    11.9986     -15.6326     219.269      138.905     24.7497
0400    13.0015     -15.8822     219.627      152.957     30.7926
0500    14.0042     -16.1345     220.009      168.74      34.2057
0600    15.007      -16.3626     220.359      185.38      34.5491
0700    16.0096     -16.5671     220.693      201.452     31.7525
0800    17.0124     -16.7741     221.089      215.787     26.2217
0900    18.0151     -16.9532     221.491      228.145     18.5978
1000    19.0178     -17.1236     221.909      238.779     9.46926
1100    MOON BELOW HORIZON
1200    MOON BELOW HORIZON
1300    MOON BELOW HORIZON
1400    MOON BELOW HORIZON
1500    MOON BELOW HORIZON
1600    MOON BELOW HORIZON
1700    MOON BELOW HORIZON
1800    MOON BELOW HORIZON
1900    MOON BELOW HORIZON
2000    MOON BELOW HORIZON
2100    MOON BELOW HORIZON
2200    MOON BELOW HORIZON
2300    MOON BELOW HORIZON
2400    MOON BELOW HORIZON
ANOTHER DAY. (YES/NO)? NO
ANOTHER OBSERVER LOCATION (YES/NO)? NO
```

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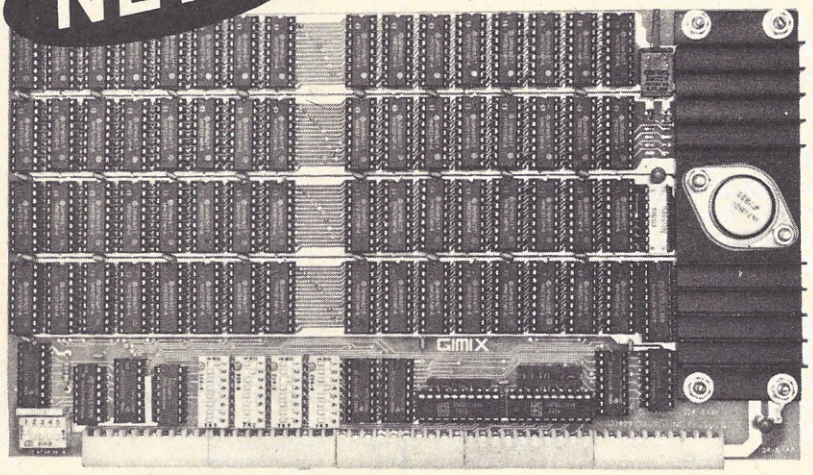

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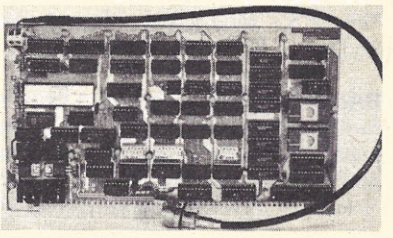

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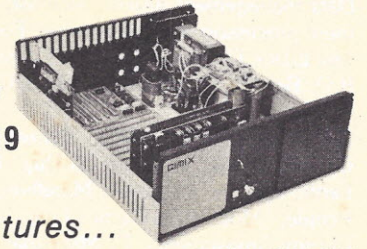

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